

# Exhibit 23

UNITED STATES DISTRICT COURT  
FOR THE EASTERN DISTRICT OF TEXAS  
MARSHALL DIVISION

---oOo---

NETLIST, INC., )  
Plaintiff. )  
vs. ) Case No.  
MICRON TECHNOLOGY, INC.; ) 2:22-cv-203-JRG-RSP  
MICRON SEMICONDUCTOR )  
PRODUCTS, INC.; MICRON )  
TECHNOLOGY TEXAS LLC, )  
Defendants. )  
\_\_\_\_\_)

VIDEOTAPED DEPOSITION OF HAROLD STONE, Ph.D.  
REMOTE PROCEEDINGS  
MONDAY, JUNE 26, 2023

STENOGRAPHICALLY REPORTED BY:  
ANDREA M. IGNACIO, CSR, RPR, CRR, CCRR, CLR ~ CSR  
LICENSE NO. 9830  
JOB NO. 5968770  
  
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1	A P P E A R A N C E S:	1	E X H I B I T S
2		2	EXHIBIT PAGE
3		3	Exhibit 6 Lattice XP2 Family Data Sheet 32
4	FOR PLAINTIFF:	4	Introduction
5	IRELL & MANELLA LLP	5	Exhibit 7 Petition for Inter Partes Review 44
6	BY: MICHAEL TEZYAN, Esq.	6	of Patent No. 9,606,907
7	HONG (ANNITA) ZHONG, Esq.	7	Exhibit 8 Microcomputer Interfacing 71
8	1800 Avenue of the Stars, Suite 900	8	Exhibit 9 U.S. Patent 8,787,050 Lee 84
9	Los Angeles, California 90067	9	Exhibit 10 Exhibit 10 A 1.2V 65Gb 341GB/s 89
10	310.277.1010	10	HBM2 Stacked DRAM with Spiral
11	mtezyan@irell.com	11	Point-to-Point TSV Structure and
12		12	Improved Bank Group Data Control
13	FOR DEFENDANT:	13	Exhibit 11 U.S. Patent Application 121
14	WINSTON & STRAWN LLP	14	2011/0103156 Kim, et al.
15	BY: MICHAEL R. RUECKHEIM, Esq.	15	Exhibit 12 U.S. Patent Application 128
16	JUAN C. YAQUIAN, Esq.	16	2011/0026293 Riho
17	255 Shoreline Drive, Suite 520	17	Exhibit 13 U.S. Patent 7,969,192 Wyman, 150
18	Redwood City, California 94065	18	et al.
19	650.858.6433	19	Exhibit 14 Frequently Asked Questions 157
20	mrueckheim@winston.com	20	Exhibit 15 Synchronous DRAM Architectures, 159
21		21	Organizations, and Alternative
22	ALSO PRESENT: Anthony Gulino, Videographer	22	Technologies
23	Lance Hoeppner, Technician	23	Exhibit 16 U.S. Patent 10,949,339 Lee 190
24	---oOo---	24	---oOo---
25		25	REMOTE PROCEEDINGS
	Page 2		Page 4
1	I N D E X	1	June 26, 2023 9:34 A.M.
2		2	---oOo--- 09:02
3	WITNESS: Harold Stone, Ph.D.	3	09:34
4		4	THE VIDEOGRAPHER: Good morning, everyone. 09:34
5		5	We are going on the record at 9:34 a.m. Pacific 09:34
6	EXAMINATION PAGE	6	Daylight Time on June 26, 2023. 09:34
7	BY MR. TEZYAN 7, 186	7	Please note that this deposition is being 09:34
8	BY MR. RUECKHEIM 185	8	conducted virtually. Quality of recording depends on 09:34
9		9	the quality of camera and Internet connection of 09:34
10	---oOo---	10	participants. What is seen from the witness and heard 09:34
11	E X H I B I T S	11	on screen is what will be recorded. 09:34
12	EXHIBIT PAGE	12	Audio and video recording will continue to 09:34
13	Exhibit 1 Declaration of Harold S. Stone, 10	13	take place unless all parties agree to go off the 09:34
14	Ph.D. in Support of Defendants'	14	record. 09:34
15	Claim Construction Positions	15	This is Media Unit 1 of the video-recorded 09:34
16		16	deposition of Dr. Harold Stone, taken by counsel for 09:34
17	Exhibit 2 Power Electronics Converters, 16	17	Plaintiff. 09:34
18	Applications, and Design	18	In the matter of Netlist, Inc. versus Micron 09:34
19	Exhibit 3 Understanding Low Drop Out (LDO) 21	19	Technology, Inc., et al. Filed in the United States 09:35
20	Regulators	20	District Court for the Eastern District of Texas, 09:35
21	Exhibit 4 U.S. Patent 11,016,918 Chen, 26	21	Marshall Division. The case number is 2:22-CV-203 JRG 09:35
22	et al.	22	RSP. 09:35
23	Exhibit 5 JDEC Standard No. 21-C DDR SDRAM 27	23	This deposition is being conducted remotely 09:35
24	Registered DIMM Design Specification	24	using virtual technology. 09:35
25	///	25	My name is Anthony Gulino, representing 09:35
	Page 3		Page 5

1 Veritext Legal Solutions, and I am the videographer. 09:35  
2 The court reporter is Andrea Ignacio from the 09:35  
3 firm Veritext Legal Solutions. 09:35  
4 I am not related to any party in this action, 09:35  
5 nor am I financially interested in the outcome. 09:35  
6 If there are any objections to proceeding, 09:35  
7 please state them at the time of your appearance. 09:35  
8 Counsel will now state their appearances and 09:35  
9 affiliations for the record, beginning with the 09:35  
10 noticing attorney. 09:35  
11 MR. TEZYAN: This is Michael Tezyan from 09:35  
12 Irell & Manella, representing Plaintiff Netlist. 09:35  
13 MR. RUECKHEIM: Mike Rueckheim from Winston & 09:36  
14 Strawn. And with me is Juan Yaquian, also from 09:36  
15 Winston & Strawn, representing Micron and the witness. 09:36  
16 THE WITNESS: I'm Harold Stone, the witness. 09:36  
17 STENOGRAPHIC REPORTER: Are you done, 09:36  
18 Mr. Videographer? 09:36  
19 THE VIDEOGRAPHER: Yes, Andrea. 09:36  
20 You can swear in the witness, please. 09:36  
21 STENOGRAPHIC REPORTER: First, I need all 09:36  
22 parties to agree that I'm in California, and the 09:36  
23 witness is in Washington, and that it is okay for me 09:36  
24 to swear in the witness, and that there will be no 09:36  
25 objections? 09:36

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1 MR. TEZYAN: That's fine. 09:36  
2 THE WITNESS: No objection. 09:36  
3 STENOGRAPHIC REPORTER: Mr. Rueckheim, I'm 09:36  
4 sorry. I didn't hear you. 09:36  
5 MR. RUECKHEIM: No objections. 09:36  
6 STENOGRAPHIC REPORTER: Thank you.  
7  
8 HAROLD STONE, Ph.D.,  
9 having been remotely sworn as a witness  
10 by the Certified Shorthand Reporter,  
11 testified as follows:  
12  
13 EXAMINATION  
14 BY MR. TEZYAN:  
15 Q Good morning. Can you please state your name 09:37  
16 for the record. 09:37  
17 A My name is Harold Stone. 09:37  
18 Q Dr. Stone, have you been deposed before? 09:37  
19 A Yes, I have. 09:37  
20 Q How many times, approximately? 09:37  
21 A It has to be approximate. I don't keep track 09:37  
22 of the exact number, but several dozen. Let's just 09:37  
23 say several dozen. 09:37  
24 Q Fair enough. 09:37  
25 Have any of those been virtual depositions? 09:37

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1 A I believe this is my first. No, there was -- 09:37  
2 I had one other. 09:37  
3 Q Okay. I just bring that up to say that if 09:37  
4 there are any, you know, technical difficulties as we 09:37  
5 go on throughout the day, that's fine. It's 09:37  
6 anticipated. 09:37  
7 So you understand you're under oath? 09:37  
8 A I understand. 09:37  
9 Q And that the testimony you're going to give 09:37  
10 today has the same effect as if you were in a court of 09:37  
11 law? 09:38  
12 A I understand that, yes. 09:38  
13 Q Is there any reason you cannot give complete 09:38  
14 and truthful testimony today? 09:38  
15 A There is no reason. 09:38  
16 Q If you answer a question, I will assume you 09:38  
17 understood it; is that fair? 09:38  
18 A Your audio is fading a little bit. Can you 09:38  
19 repeat, please. 09:38  
20 Q Sure. 09:38  
21 My question was: If you answer my question, 09:38  
22 I will assume you understood it; is that fair? 09:38  
23 A That is fair, yes. 09:38  
24 Q Okay. Are there any documents in the room 09:38  
25 with you today? 09:38

Page 8

1 A I -- you're asking, do I have any documents 09:38  
2 in my room? 09:38  
3 Q Yes. 09:38  
4 A There are documents all over the place, none 09:38  
5 of which I rely on and none of which I will use. 09:38  
6 Q What's your setup like today? 09:38  
7 A My setup today has a laptop that I'm facing. 09:38  
8 When I turn like this, I'm looking at a large 09:38  
9 replication of the screen. I'm sitting at a desk. 09:39  
10 Off screen to my right, there is a printer 09:39  
11 reader and a bookcase with books and other things and 09:39  
12 loose papers, but none of which I will rely on. 09:39  
13 Q Okay. So you don't have a printed copy of 09:39  
14 your declaration in front of you? 09:39  
15 A I do not. 09:39  
16 Q Okay. Do you have any notes with you? 09:39  
17 A I do not. 09:39  
18 Q Okay. What did you do to prepare for today's 09:39  
19 deposition? 09:39  
20 A To prepare for this deposition, I read my 09:39  
21 declaration. I read the patents at -- at -- in the 09:39  
22 case. I read the materials cited in my depo- -- in my 09:39  
23 declaration. That would include the materials 09:39  
24 included by reference. And when I said "read," it's 09:40  
25 more like scanned, because there's a lot of them. I 09:40

Page 9

1 met with attorneys. 09:40	1 dec- -- oh, I'm sorry. What is that? 09:43
2 And that's -- that's about it. 09:40	2 A This is a voltage converter for USB. 09:43
3 Q What materials did you review in your 09:40	3 Q Okay. 09:43
4 declaration in preparation for your deposition today? 09:40	4 A It takes 110 volts in through these prongs 09:43
5 A What materials did I review? 09:40	5 and produces a voltage out that will power -- let's 09:43
6 I reviewed my declaration. I reviewed the 09:40	6 say it will recharge a phone. 09:43
7 reply brief from the -- from the litigants, reply from 09:40	7 Also, I'm on a laptop. The laptop runs on 09:43
8 Netlist. I reviewed the reply by Micron. I already 09:41	8 DC. It's plugged into a voltage converter that's 09:43
9 mentioned looking at the patents. 09:41	9 plugged into the aux AC. 09:43
10 To my recollection, that's a fair 09:41	10 So those are two examples. 09:43
11 representation. I think I've covered them all, but I 09:41	11 Q Okay. And what are those voltage 09:44
12 might have missed something. 09:41	12 conversion -- sorry. Strike that. 09:44
13 MR. TEZYAN: Now, if you'd go over to your 09:41	13 Just generally, what kind of components are 09:44
14 Exhibit Share and you go into the Marked Exhibits 09:41	14 voltage conversion circuits made up of? 09:44
15 folder, you'll see that I have premarked Exhibit 1. 09:41	15 A Generally, there are many different kinds of 09:44
16 Can you please pull up Exhibit 1. 09:41	16 components. It's -- it could be a long list. 09:44
17 (Document remotely marked Exhibit 1 09:41	17 But I would start with a transformer, for 09:44
18 for identification.) 09:41	18 example. In some instances, they use transformers. 09:44
19 THE WITNESS: Okay. 09:41	19 It would have perhaps diodes, transistors, resistors, 09:44
20 MR. TEZYAN: Q. And let me know when you 09:41	20 inductors, capacitors, that type of thing. 09:44
21 have it, sir. 09:41	21 Q Just a moment. I'm trying to introduce an 09:45
22 A I have Exhibit 1. That's my declaration. 09:41	22 exhibit. 09:45
23 Q So Dr. Stone, what does it mean to convert a 09:42	23 What about buck converters? What components 09:45
24 voltage? 09:42	24 are those made up of? 09:45
25 A Just a moment. I need to -- I'm going to 09:42	25 A Well, there's a range of buck converters, and 09:45
Page 10	Page 12
1 shrink this, if you don't mind. I'm going to get 09:42	1 they include the buck converter that would have an 09:46
2 the -- okay. Now I can look at you. 09:42	2 inductor, capacitor, diode, perhaps, transistors. 09:46
3 And you said, Dr. Stone, what do I mean by 09:42	3 Those are among the components that would be in a buck 09:46
4 convert -- convert -- I didn't get the word. 09:42	4 converter. 09:46
5 Converted or converter? 09:42	5 Q And what do each of those components do? 09:46
6 Q Sure. I'll repeat the question. 09:42	6 For example, what does an inductor do? 09:46
7 What does it mean to convert a voltage? 09:42	7 A I left out switch. There would be a switch. 09:46
8 A What does it mean to convert a voltage? 09:42	8 That would be the transistor. 09:46
9 It means to take an input voltage and to 09:42	9 But the -- the inductor reacts to change -- 09:46
10 change it into an output voltage. 09:42	10 voltage changes and to -- sorry -- to -- $L \, di/dt$ is 09:46
11 Q Change it how? 09:42	11 the voltage across the inductor. So it responds to 09:46
12 A Depends on the converter. There are many 09:42	12 the change of current and develops a voltage across 09:46
13 different ways. 09:42	13 it. 09:46
14 Q So let's say we have a 5-volt input voltage, 09:42	14 Q And what does a capacitor do in the context 09:47
15 and that's received by a component, which then outputs 09:42	15 of a buck converter? 09:47
16 a 3.3-volt output voltage. Is that conversion? 09:42	16 A Well, it stores charge and it smooths out 09:47
17 A That is. 09:42	17 voltages. It controls the frequency of oscillation of 09:47
18 Q What types of voltage conversion circuitry 09:43	18 an LC circuit so that the -- the swings are at 09:47
19 would a person of ordinary skill in the art, at the 09:43	19 frequencies that reflect the capacitance and the 09:47
20 time of the '918 and '054 inventions, have been 09:43	20 inductance. So it has multiple functions. 09:47
21 familiar with? 09:43	21 Q And what does -- I believe you said a 09:47
22 A There are many different kinds of converters 09:43	22 transistor is another component in a buck converter; 09:47
23 that a person of ordinary skill in the art would know. 09:43	23 correct? 09:47
24 Q Can you give me some examples? 09:43	24 A Yeah, I said that. It could be a diode or a 09:47
25 And feel free at any time to refer to your 09:43	25 transistor. We need a switch of some sort. 09:47
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<p>1 Q Okay. And -- and what does the switch in the 09:47 2 buck converter do? 09:47 3 A It switches the voltage on and off 09:47 4 internally. 09:47 5 Q Got it. 09:47 6 What is the function of a resistor in a buck 09:48 7 converter? 09:48 8 A It depends where it's located. But 09:48 9 generally, I can talk about the function of a 09:48 10 resistor. I don't know the structure that you're 09:48 11 dealing with. 09:48 12 But the -- in typical situations, including 09:48 13 those in a buck converter, a resistor would take -- 09:48 14 carry current and have a voltage drop across it, and 09:48 15 that voltage drop would affect the output voltage. 09:48 16 Q Are you familiar with boost converters, 09:48 17 Dr. Stone? 09:48 18 A I am. 09:48 19 Q And what components comprise a boost 09:48 20 converter? 09:48 21 A Actually, a boost converter would have 09:48 22 roughly the same kinds of components that a buck 09:48 23 converter would have. So everything I named for buck 09:48 24 converter you might find in a boost converter, but the 09:48 25 circuitry is different. So it's not the -- the 09:48</p> <p style="text-align: right;">Page 14</p>	<p>1 for identification.) 09:50 2 THE WITNESS: My monitor says it's coming up, 09:50 3 but it's taking a while, so I'm not sure what's 09:50 4 happening. 09:50 5 Ah, it's -- I have a message, "Generating 09:50 6 file preview." May take a while. 09:50 7 MR. TEZYAN: Yeah, alternative to using the 09:50 8 file preview, you can download the exhibit. It might 09:50 9 be a little easier to do it that way. 09:50 10 THE WITNESS: I don't see a link for 09:51 11 downloading, so -- 09:51 12 THE VIDEOGRAPHER: Doctor, if you just -- 09:51 13 THE WITNESS: Oh, I got it. Power 09:51 14 Electronics. Page 1 of 37. It came up. 09:51 15 MR. TEZYAN: Great. 09:51 16 Q And Exhibit 2 is a book titled: 09:51 17 "Power Electronics: Converters, 09:51 18 Applications, and Design. Second Edition." 09:51 19 Is that right? 09:51 20 A That's correct. 09:51 21 Q Can you please jump to page 165. And that's 09:51 22 internal page number, so... 09:51 23 A I see page 1 of 37. So let's see how I can 09:51 24 get to 165. 09:51 25 Q It's PDF page 20. 09:51</p> <p style="text-align: right;">Page 16</p>
<p>1 structure of a boost converter is not the same as the 09:49 2 structure of a buck converter. 09:49 3 Q But both have defined structures; right, sir? 09:49 4 A Well, there are many ways you can build a 09:49 5 boost converter and many ways you can build the buck 09:49 6 converter. So I can't say that there is a single 09:49 7 structure that covers either of them. 09:49 8 Q But both are understood to have common 09:49 9 structural components; right? 09:49 10 A I believe that both -- a person of ordinary 09:49 11 skill in the art would understand common components in 09:49 12 a buck converter and common components in a boost 09:49 13 converter. 09:49 14 Q And those are common structural components; 09:49 15 right? 09:49 16 A Well, there's some aspects that are in 09:49 17 common, but there's variations. So I don't know. 09:49 18 I -- I can't answer your question specifically. I'm 09:49 19 not sure how much variation you're allowing in the 09:49 20 answer. 09:49 21 MR. TEZYAN: I've gone ahead and marked 09:50 22 Exhibit 2, Dr. Stone. 09:50 23 Could you please refresh your Exhibit Share 09:50 24 and let me know when you see Exhibit 2? 09:50 25 (Document remotely marked Exhibit 2 09:50</p> <p style="text-align: right;">Page 15</p>	<p>1 A 20. Got it. 09:51 2 Q Now, at the top, you see a circuit diagram, 09:51 3 correct, right below where it says: 09:52 4 "7-3 Step-Down (Buck) Converter." 09:52 5 A "Step-down dc-dc converter." 09:52 6 7-4. I see that. 09:52 7 Q Oh, so I'm -- I'm talking about the -- yeah, 09:52 8 so 7-4 (a), the figure that depicts the -- the circuit 09:52 9 diagram. 09:52 10 Do you see that? 09:52 11 A I see that. 09:52 12 Q And this is a circuit diagram for a buck 09:52 13 converter; right? 09:52 14 A That's what it claims. That's correct. 09:52 15 Q And the circuit diagram depicts an inductor, 09:52 16 right, right above the L? 09:52 17 A I see that. 09:52 18 Q And there is a capacitor, the C; right? 09:52 19 A I see that. 09:52 20 Q And then there is a resistor to the right? 09:52 21 A I see that. 09:52 22 Q And these are all common structural elements 09:52 23 for a buck converter; right? 09:52 24 A Oh, yes. I -- I believe that they're common 09:52 25 in a buck converter, or at least that they're -- 09:52</p> <p style="text-align: right;">Page 17</p>

1 they're in this buck converter. 09:52	1 Q And if you'll just bear with me as I find 09:55
2 Q Can you please jump to PDF page 27. 09:53	2 another exhibit. 09:55
3 A Okay. I'm there. 09:53	3 And the function of an LDO, sir, is to 09:56
4 Q Do you see Figure 7-11 which says: 09:53	4 convert an input voltage into an output voltage; is 09:56
5 "Step-up dc-dc converter." 09:53	5 that correct? 09:56
6 A I thought I was on page -- I'm sorry. No, I 09:53	6 A That -- that's largely correct. There may be 09:56
7 see it. Okay. I'm in -- I'm on page 27, Figure 7-11. 09:53	7 other stipulations about the nature of what the 09:56
8 I see that. 09:53	8 conversion is. But that's basically what a general 09:56
9 Q And another work -- another way to -- sorry. 09:53	9 statement of what an LDO converter does. 09:56
10 Strike that. 09:53	10 Q And to be more precise about it, an LDO will 09:56
11 A step-up dc-dc converter is otherwise known 09:53	11 convert an input voltage into a lower output voltage; 09:56
12 as a boost converter; right? 09:53	12 is that fair? 09:56
13 A That's one name for it, yes. 09:53	13 A I have not prepared to talk about LDO 09:56
14 Q And we see here in this diagram, Figure 7-11, 09:53	14 converters. So to my knowledge, it might be correct. 09:56
15 this is a circuit diagram for a boost converter; fair? 09:53	15 But then again, there may be LDO converters that 09:56
16 A I see that. 09:54	16 increase voltage. But I'm not prepared to answer that 09:56
17 Q And we see that the boost converter comprises 09:54	17 question based on what I prepared with regard to the 09:57
18 a capacitor next to the C; right? 09:54	18 patents. 09:57
19 A I see that. 09:54	19 MR. YAQUIAN: Sorry. This is -- this is Juan 09:57
20 Q And then you have an inductor below the L on 09:54	20 with Winston & Strawn. Sorry to cut off. Mike is 09:57
21 the left; right? 09:54	21 having depo -- Mike is having technical issues. He 09:57
22 A I see that. 09:54	22 needs to log on or re- -- log on or log off. So can 09:57
23 Q And you have a resistor next to the R? 09:54	23 we just wait a moment? He needs to log off and log 09:57
24 A I see that. 09:54	24 back on. 09:57
25 Q And these are all common structural elements 09:54	25 MR. TEZYAN: That's fine. Let's go off the 09:57
Page 18	Page 20
1 for a boost converter; right? 09:54	1 record. 09:57
2 A I believe one of skill in the art would 09:54	2 THE VIDEOGRAPHER: Okay. We're going to go 09:57
3 understand these to be common in boost converters. 09:54	3 off the record. The time is 9:57 a.m. 09:57
4 And certainly, they're in this boost converter. 09:54	4 And this is the end of Media No. 1. 09:57
5 Q Okay. So one of skill in the art would 09:54	5 (Recess taken.) 09:57
6 understand that inductors, capacitors, and resistors 09:54	6 THE VIDEOGRAPHER: Okay. We are going back 10:20
7 are common to both boost converters and buck 09:54	7 on the record. The time is 10:20 a.m. 10:20
8 converters; fair? 09:54	8 And this is the start of Media No. 2. 10:20
9 A I think that's fair. 09:54	9 MR. TEZYAN: Welcome back, Dr. Stone. 10:20
10 MR. TEZYAN: Okay. You can close out of 09:54	10 Q Did you have any communications with your 10:20
11 Exhibit 2. 09:54	11 counsel on the break? 10:20
12 THE WITNESS: Okay. 09:55	12 A I did not. 10:20
13 MR. TEZYAN: Q. So a buck boost converter is 09:55	13 MR. TEZYAN: If you go to your Exhibit Share 10:20
14 another type of voltage conversion circuitry that a 09:55	14 and refresh, you should see Exhibit No. 3. Please let 10:20
15 person of ordinary skill in the art would have been 09:55	15 me know when you have it. 10:20
16 familiar with at the time of the '918 and 09:55	16 (Document remotely marked Exhibit 3 10:20
17 '054 patents; right? 09:55	17 for identification.) 10:20
18 A That's correct. 09:55	18 THE WITNESS: I must have lost my -- wait a 10:21
19 Q But what about an LDO? 09:55	19 minute. I've got it. I -- I got the right web page. 10:21
20 A An LDO? That -- you're speaking of a low 09:55	20 I'm not clicking on Exhibit 3. I have Exhibit 3. 10:21
21 dropout? 09:55	21 MR. TEZYAN: Okay. 10:21
22 Q Yes. 09:55	22 Q And Exhibit 3 is a paper titled: 10:21
23 A Okay. Low dropout. I believe that one of 09:55	23 "Understanding Low Drop Out (LDO) 10:21
24 skill in the art would know what an LDO converter is 09:55	24 Regulators." 10:21
25 at the time of the patents. 09:55	25 Right? 10:21
Page 19	Page 21



1 A That's correct. 10:21	1 of electrical components. 10:24
2 Q And if you could please navigate to page 2. 10:21	2 MR. TEZYAN: Q. So are you familiar with 10:24
3 A I am there. 10:21	3 registered DIMMs, Dr. Stone? 10:24
4 Q At the bottom of page 2 is a circuit diagram 10:21	4 A And DIMM is D-I-M-M; is that correct? 10:25
5 for an LDO; is that correct? 10:21	5 Q Yes. It stands for dual in-line memory 10:25
6 A I see that. That's correct. 10:21	6 module; right? 10:25
7 Q And an LDO comprises a transistor switch; 10:21	7 A Okay. I am familiar, yes. 10:25
8 right? 10:21	8 Q You're familiar with registered DIMMs in 10:25
9 A The LDO comprises a transistor switch? Is 10:21	9 specific? 10:25
10 that what you said? 10:21	10 A Yes, I am familiar with registered DIMM, 10:25
11 Q Yes, sir. 10:21	11 D-I-M-M. 10:25
12 A I don't see a switch in this diagram. Are 10:22	12 Q Right. 10:25
13 you saying that this diagram has a switch? 10:22	13 And a registered DIMM has a component on it 10:25
14 Q Yes, that was the question. 10:22	14 that's called a registered clock driver, right, 10:25
15 A I don't see a switch. 10:22	15 otherwise known as an RCD? 10:25
16 Q Does an LDO generally comprise a transistor 10:22	16 A I need a specific example, because I need to 10:25
17 switch? 10:22	17 know the -- the scope of your registered DIMM. The 10:25
18 A I'm not aware of an LDO with a transistor 10:22	18 clock driver may be on it or external to it. So I 10:25
19 switch. There may be some. As I indicated, I have 10:22	19 can't answer your question as asked. 10:25
20 not prepared LDO material. 10:22	20 Q I'm sorry. Let me ask a foundational 10:25
21 Q Dr. Stone, what is a circuit? 10:22	21 question. 10:25
22 A That's a very general question. I believe 10:22	22 Do you know what an RCD is? 10:25
23 that the dictionary definitions I've seen presented to 10:23	23 A Would you repeat the acronym. 10:26
24 me say that a circuit is a collection of components 10:23	24 Q Sure. 10:26
25 that create a path, that type of thing; very generic, 10:23	25 RCD stands for registering clock driver. 10:26
Page 22	Page 24
1 very general. I can't -- I -- I can't come up with a 10:23	1 A Register and clock driver? 10:26
2 firm definition -- (computer chiming) 10:23	2 Q Registering clock driver. 10:26
3 STENOGRAPHIC REPORTER: I'm sorry. The bell. 10:23	3 A I know the acronym, but as you express it, 10:26
4 "I can't come up with a firm definition" -- 10:23	4 it's not firm in my mind what -- exactly what you 10:26
5 THE WITNESS: Okay. I -- I can't come up 10:23	5 mean. A registered clock driver or -- I'm having 10:26
6 with a definition that will withstand scrutiny in all 10:23	6 difficulty analyzing what your acronym is exactly. 10:26
7 cases. 10:23	7 Q Let's jump to your declaration, sir, if you 10:27
8 MR. TEZYAN: Okay. 10:23	8 have it open. 10:27
9 Q But what would a person of ordinary skill in 10:23	9 A I don't have it open. I'm relying on you. 10:27
10 the art understand the term "circuit" to mean? 10:23	10 Oh, you want -- I'm sorry. It's my Exhibit 1; right? 10:27
11 A I believe a person of ordinary skill will 10:23	11 Q Yes, sir. 10:27
12 understand a circuit to be a collection of 10:23	12 A I have -- I have Exhibit 1 open. 10:27
13 components -- electrical components. And beyond that, 10:24	13 Q Let's jump to PDF page 23. 10:27
14 there may be other aspects that would be in the 10:24	14 A That's the page that says PDF page 23? 10:27
15 definition. But it would start with a collection of 10:24	15 Q Uh-huh. 10:27
16 electrical components connected together in some 10:24	16 A Okay. It -- 10:27
17 fashion. 10:24	17 Q So underneath "Corresponding Structure," you 10:27
18 Q Okay. And those voltage conversion circuits 10:24	18 use a term called "memory module controller." 10:27
19 that we talked about, buck converters, boost 10:24	19 Do you see that? 10:27
20 converters, LDO converters, would those be examples of 10:24	20 A I see that. 10:27
21 a collection of electrical components? 10:24	21 Q What does that mean? 10:27
22 MR. RUECKHEIM: Object to the form. 10:24	22 Is that referring to, for example, 10:27
23 THE WITNESS: I'm looking at this figure, and 10:24	23 controller 1062 in the '918 patent? 10:28
24 I see electrical components, and I see a collection. 10:24	24 A The memory module controller, I believe, is 10:28
25 And so I believe that I would call this a collection 10:24	25 1062, but I'd have to take a moment to just confirm. 10:28
Page 23	Page 25



<p>1 If you don't mind bringing up the '918 patent 10:28</p> <p>2 so I can confirm the 1062 is the memory module 10:28</p> <p>3 controller, that would be helpful. 10:28</p> <p>4 MR. TEZYAN: Sure. Okay. 10:28</p> <p>5 Please refresh your Exhibit Share, and let me 10:29</p> <p>6 know when you see Exhibit 4. 10:29</p> <p>7 THE WITNESS: Okay. I have refreshed. 10:29</p> <p>8 (Document remotely marked Exhibit 4 10:29</p> <p>9 for identification.) 10:29</p> <p>10 THE WITNESS: I have the exhibit. 10:29</p> <p>11 MR. TEZYAN: Q. What is Exhibit 4? 10:29</p> <p>12 A Exhibit 4 is the '918 patent. It's taking a 10:29</p> <p>13 while to come up, so I don't see it yet. I've got the 10:29</p> <p>14 message saying the file created may take a while, but 10:29</p> <p>15 it's coming. 10:29</p> <p>16 It's here. I have it. 10:30</p> <p>17 Q Okay. And can you please confirm, now that 10:30</p> <p>18 you have it, that Exhibit 4 is the '918 patent? 10:30</p> <p>19 A I confirm that Exhibit 4 is the '918 patent. 10:30</p> <p>20 Q And -- and take your time to review it, sir, 10:30</p> <p>21 if you need to to refresh your memory. 10:30</p> <p>22 But the question was, just to remind you, is 10:30</p> <p>23 the memory module controller that you referred to in 10:30</p> <p>24 your declaration controller 1062? 10:30</p> <p>25 A Just a moment. 10:30</p> <p style="text-align: right;">Page 26</p>	<p>1 Registered Design Specification" dated January 2002. 10:33</p> <p>2 I'm now going to go to page 10. 10:34</p> <p>3 I have page 10. 10:34</p> <p>4 Q And on page 10, depicted here is a block 10:34</p> <p>5 diagram for a particular Raw Card configuration; is 10:34</p> <p>6 that right? 10:34</p> <p>7 A That's correct. 10:34</p> <p>8 Q Okay. And if you go to the bottom left 10:34</p> <p>9 corner of page 10, you see this diagram that includes 10:34</p> <p>10 a register with signals coming in on the left and 10:34</p> <p>11 another set of signals going in on the right? 10:34</p> <p>12 A I see that. 10:34</p> <p>13 Q Okay. And the register that's depicted here 10:34</p> <p>14 is a circuit; correct? 10:34</p> <p>15 A That's correct. 10:34</p> <p>16 Q Now, the '918 patent discloses in the 10:35</p> <p>17 specification various examples of the controller; is 10:35</p> <p>18 that correct? 10:35</p> <p>19 A "The controller" being the memory 10:35</p> <p>20 controller 1062. And it -- it is correct that there 10:35</p> <p>21 are examples of the memory controller in the 10:35</p> <p>22 '918 patent. 10:35</p> <p>23 Q And an FPGA is one of those examples; right? 10:35</p> <p>24 A I -- would you say that again, please. I 10:35</p> <p>25 didn't get the acronym. 10:35</p> <p style="text-align: right;">Page 28</p>
<p>1 It is 1062. That's correct. 10:31</p> <p>2 Q Okay. Thank you. 10:31</p> <p>3 I'm going to go ahead and introduce 10:31</p> <p>4 Exhibit 5. 10:31</p> <p>5 (Document remotely marked Exhibit 5 10:31</p> <p>6 for identification.) 10:31</p> <p>7 MR. TEZYAN: Q. Please refresh your Exhibit 10:31</p> <p>8 Share, and let me know when it comes up. 10:31</p> <p>9 A I have started the load. I have an 10:31</p> <p>10 indication that the load is occurring. Again, I have 10:31</p> <p>11 the message that says that the file preview may take a 10:32</p> <p>12 while. 10:32</p> <p>13 Q That's fine. 10:32</p> <p>14 When it comes up, can you please go to PDF 10:32</p> <p>15 page 10. 10:32</p> <p>16 A Okay. 10:32</p> <p>17 Q And before that, I should ask, if you go back 10:32</p> <p>18 to page 1, can you please confirm that this is the 10:32</p> <p>19 JEDEC 21-C "DDR SDRAM Registered DIMM Design 10:32</p> <p>20 Specification"? 10:32</p> <p>21 A I will confirm that when I see it. 10:32</p> <p>22 Q Fair enough. 10:32</p> <p>23 A It just came up. 10:33</p> <p>24 Q Okay. 10:33</p> <p>25 A Okay. I see that this is the "DDR SDRAM 10:33</p> <p style="text-align: right;">Page 27</p>	<p>1 Q Sure. 10:35</p> <p>2 An FPGA is one -- 10:35</p> <p>3 A An FPGA. Yes, I believe that's the case. 10:36</p> <p>4 FPGA is an example. It's -- the way it is displayed, 10:36</p> <p>5 it doesn't -- it's not indicative that it's the whole 10:36</p> <p>6 memory controller. But it -- it -- there is a memory 10:36</p> <p>7 controller that comprises an FPGA. 10:36</p> <p>8 Q Okay. And what is an FPGA? 10:36</p> <p>9 A An FPGA is a field programmable gate array. 10:36</p> <p>10 Q What is it comprised of? 10:36</p> <p>11 A Well, there are many different FPGAs. 10:36</p> <p>12 Normally, it has gates within it. It has a 10:36</p> <p>13 programming structure that allows external volts, 10:36</p> <p>14 external voltages to cause changes in the FPGA so that 10:36</p> <p>15 it can become different circuits, depending on the 10:37</p> <p>16 programming. 10:37</p> <p>17 Q Okay. So an FPGA has to be comprised of some 10:37</p> <p>18 type -- some type of circuitry; is that right? 10:37</p> <p>19 A That's correct. 10:37</p> <p>20 Q And what kind of circuitry is that? 10:37</p> <p>21 A Well, it varies across FPGAs. The circuitry 10:37</p> <p>22 at the lowest level would involve conductors and some 10:37</p> <p>23 sort of devices that allow it to be programmed. They 10:37</p> <p>24 could be fuses, for example, or they could be devices 10:38</p> <p>25 that assume a state and retain that state when -- when 10:38</p> <p style="text-align: right;">Page 29</p>

<p>1 volts -- when power is removed. 10:38</p> <p>2 And beyond that, the components of an FPGA 10:38</p> <p>3 are whatever people choose to put into it. 10:38</p> <p>4 Q And what is an ASIC, sir? 10:38</p> <p>5 A ASIC is A-S-I-C, application-specific 10:38</p> <p>6 integrated circuit. 10:38</p> <p>7 Q And what is an ASIC comprised of? 10:38</p> <p>8 A Well, it's comprised of whatever the designer 10:38</p> <p>9 chooses to put into it. Be- -- because it is 10:38</p> <p>10 application-specific, different applications will use 10:38</p> <p>11 different components in ASICs built for those 10:39</p> <p>12 applications. So I can't tell you exactly what is in 10:39</p> <p>13 an ASIC. 10:39</p> <p>14 Q Were you finished with your answer, sir? 10:39</p> <p>15 A I -- I -- would you repeat your question. 10:39</p> <p>16 Q Oh, I'm sorry. I felt as if I almost cut you 10:39</p> <p>17 off. I just wanted to know if you were finished with 10:39</p> <p>18 your answer. 10:39</p> <p>19 A I -- I'm done with my answer. 10:39</p> <p>20 Q Okay. But an ASIC is still an integrated 10:39</p> <p>21 circuit; right? 10:39</p> <p>22 A It is an integrated circuit. That is 10:39</p> <p>23 correct. 10:39</p> <p>24 Q There is -- there is -- there are certain 10:39</p> <p>25 circuitry that has to be common to all ASICs; right? 10:39</p> <p style="text-align: right;">Page 30</p>	<p>1 device A and a memory device B and ask the question, 10:41</p> <p>2 do these two devices have elements in common, I would 10:41</p> <p>3 be able to look and investigate. 10:41</p> <p>4 I -- your -- your question is so broad, I'm 10:41</p> <p>5 not sure that I can answer it. 10:41</p> <p>6 (Document remotely marked Exhibit 6 10:42</p> <p>7 for identification.) 10:42</p> <p>8 MR. TEZAN: I'm introducing Exhibit 6. 10:42</p> <p>9 Q Dr. Stone, could you please refresh your 10:42</p> <p>10 Exhibit Share, and let me know when you see Exhibit 6. 10:42</p> <p>11 A I am -- I see the list that says Exhibit 6. 10:42</p> <p>12 I'm clicking on the link. My screen shows that the 10:42</p> <p>13 PDF file is loading. 10:42</p> <p>14 I have it. 10:43</p> <p>15 Q Okay. So Exhibit 6 is titled: 10:43</p> <p>16 "LatticeXP2 Family Data Sheet Introduction." 10:43</p> <p>17 Is that right? 10:43</p> <p>18 A That's correct. 10:43</p> <p>19 Q And it's dated May 2007; right? 10:43</p> <p>20 A May 2007. That's correct. 10:43</p> <p>21 Q If you'd go to page 2. And you can read that 10:43</p> <p>22 first sentence below "Introduction" to yourself. 10:44</p> <p>23 A (Reading document.) 10:44</p> <p>24 I see that. 10:44</p> <p>25 Q This is an example of an FPGA that's designed 10:44</p> <p style="text-align: right;">Page 32</p>
<p>1 At the very least, conductors and -- and that 10:39</p> <p>2 sort of low-level circuitry; right? 10:39</p> <p>3 A You used the word "all," some things common 10:39</p> <p>4 to all ASICs. I can't testify that every ASIC has 10:39</p> <p>5 some specific thing in it because of the wide -- wide 10:39</p> <p>6 variety. 10:39</p> <p>7 Q Are there some ASICs that are not integrated 10:39</p> <p>8 circuits? 10:40</p> <p>9 A I believe that all ASICs are integrated 10:40</p> <p>10 circuits, yes. 10:40</p> <p>11 Q And integrated circuits have common low-level 10:40</p> <p>12 components to them; is that fair? 10:40</p> <p>13 A I don't think that's fair. 10:40</p> <p>14 Q Can you explain? 10:40</p> <p>15 A May I give an example? 10:40</p> <p>16 Q Please. 10:40</p> <p>17 A A quantum computer circuit may not have any 10:40</p> <p>18 components in common with an ASIC that you have, and 10:40</p> <p>19 yet the quantum computer ASIC is an ASIC. 10:40</p> <p>20 Q Fair enough. 10:41</p> <p>21 What about ASICs designed specifically for 10:41</p> <p>22 the use in memory modules? Would those integrated 10:41</p> <p>23 circuits have components in common? 10:41</p> <p>24 MR. RUECKHEIM: Object to the form. 10:41</p> <p>25 THE WITNESS: If you present a memory 10:41</p> <p style="text-align: right;">Page 31</p>	<p>1 by Lattice; right? 10:44</p> <p>2 A I have not seen this document before. But if 10:44</p> <p>3 that's what you say it is, I -- I -- I say that it's 10:44</p> <p>4 consistent with what you represent. 10:44</p> <p>5 Q Well, that first sentence says: 10:44</p> <p>6 "LatticeXP2 devices combine a Look-up 10:44</p> <p>7 Table" -- "based FPGA fabric with non-volatile Flash 10:44</p> <p>8 cells in an architecture referred to as flexiFLASH." 10:44</p> <p>9 Right? 10:44</p> <p>10 A I see that, yes. 10:44</p> <p>11 Q And the document is titled: 10:44</p> <p>12 "LatticeXP2 Family Data Sheet Introduction." 10:44</p> <p>13 Right? 10:45</p> <p>14 A Yes. 10:45</p> <p>15 Q So fair to say that this is a data sheet for 10:45</p> <p>16 a Lattice FPGA? 10:45</p> <p>17 A That's what you're representing. I -- I 10:45</p> <p>18 don't dispute that. 10:45</p> <p>19 Q Let's go to page 4 of this document. 10:45</p> <p>20 A I'm on page 4. 10:45</p> <p>21 Q And you see Figure 2-1 is a block diagram of 10:45</p> <p>22 the LatticeXP2 device; right? 10:45</p> <p>23 A XP2-17. Yes. 10:45</p> <p>24 Q Correct. 10:45</p> <p>25 And you see that the device is comprised of 10:46</p> <p style="text-align: right;">Page 33</p>

1 several components; right? 10:46	1 A They would have conductors, yes. 10:49
2 A I see that, yes. 10:46	2 Q Okay. Would controllers for memory devices 10:49
3 Q And that includes flash; right? 10:46	3 have other components in common? 10:49
4 A I'm looking. It says, yes, flash. 10:46	4 A I don't see why they should. 10:49
5 Q Flash is a type of nonvolatile memory; right? 10:46	5 Q Okay. But a controller performs the function 10:50
6 A That's correct. 10:46	6 of, I think you said, something that controls -- so 10:50
7 MR. TEZYAN: Okay. We can close out 10:46	7 strike that. Sorry. 10:50
8 Exhibit 6. 10:46	8 And I think we can agree that a controller 10:50
9 Q Now, what would a person of ordinary skill in 10:46	9 performs the function of controlling some other 10:50
10 the art understand the term "controller" to mean? 10:46	10 component; is that fair? 10:50
11 A The term "controller" is very general. Let 10:46	11 A I don't even know that it controls some other 10:50
12 me give an example from the patents. Let's see. We 10:47	12 component. It controls. That's fair. 10:50
13 have the '918 patent. May I bring it up? 10:47	13 Q Okay. It controls something; right? 10:50
14 Q Yes. It's Exhibit No. 4. 10:47	14 A Something. That's right. 10:50
15 A Exhibit -- yeah, I -- I'm going to back away 10:47	15 Q Okay. And would that something have to be 10:50
16 from that. 10:47	16 something other than itself? 10:50
17 It -- a controller is basically something 10:47	17 A I'm not sure. 10:51
18 that controls. But beyond that, it's not at all clear 10:47	18 Q Let me rephrase the question. 10:51
19 what the specifics of a controller are. 10:47	19 Would a person of ordinary skill in the art 10:51
20 So I -- I don't know exactly what one of 10:47	20 typically understand a controller to be a device that 10:51
21 skill in the art would understand a controller to be, 10:47	21 controls something other than itself? 10:51
22 beyond a device or something that does the control 10:47	22 A I think that's a fair understanding of a 10:51
23 function. 10:48	23 person of skill in the art. 10:51
24 Q Okay. But a controller is an electronic 10:48	24 But if you ask me if there are instances 10:51
25 device; fair? 10:48	25 where it can control itself, that would be an 10:51
Page 34	Page 36
1 MR. RUECKHEIM: Object to the form. 10:48	1 interesting question. It might still be a controller 10:51
2 THE WITNESS: Among the universe of 10:48	2 controlling only itself. 10:51
3 controllers, some are electronic devices, but not all. 10:48	3 Q Fair enough. 10:51
4 MR. TEZYAN: Okay. 10:48	4 But typically, a person of ordinary skill in 10:51
5 Q Well, in the context of memory modules, a 10:48	5 the art would understand that a controller is a device 10:51
6 controller specifically for use in a memory module 10:48	6 that controls some other component; right? 10:51
7 would be an electronic device; fair? 10:48	7 A I think we're talking about typically or in 10:51
8 A A memory controller -- a controller for a 10:48	8 general, but not necessarily every case. 10:51
9 memory device would be electronic. I believe that's 10:48	9 Q Okay. And in order to control some other 10:51
10 fair, yes. 10:48	10 component, the controller has to be connected to that 10:51
11 Q Okay. And electronic devices generally have 10:48	11 component; is that fair? 10:51
12 certain low-level components in common, right, such as 10:48	12 A I don't fully know your context. I can give 10:52
13 the ones we talked about earlier, like conductors? 10:48	13 examples where it's not connected. 10:52
14 A Certain, yes. But even memory devices -- 10:48	14 Q Okay. And in what way can a controller not 10:52
15 device memory A and device memory B may have nothing 10:48	15 be connected to the -- 10:52
16 in common; very little in common, if anything. 10:48	16 A I have wireless chargers, for example. 10:52
17 Q Okay. But controllers for memory modules 10:49	17 They -- you put a device inside the wireless charger 10:52
18 specifically, they would have at least certain aspects 10:49	18 and it charges up. The wireless charger is 10:52
19 in common, right, like -- I'm sorry. Strike that. 10:49	19 controlling the device that's being charged. There is 10:52
20 So do -- do we agree that controllers for 10:49	20 no connection. 10:52
21 memory devices comprise conductors, at least? 10:49	21 Q Okay. Outside the context of wireless 10:52
22 A Conductors being a metal of some sort that 10:49	22 communications or charging, a controller necessarily 10:52
23 conduct electricity. 10:49	23 has to be connected to the item that it's controlling? 10:52
24 Is that what you mean? 10:49	24 A You keep -- you keep saying things like 10:52
25 Q Yes. 10:49	25 "necessarily" or "all" or whatever, and it -- it 10:52
Page 35	Page 37

<p>1 bothers me. 10:52</p> <p>2 I would say that a controller is usually 10:52</p> <p>3 connected to the thing that's controlled, but I would 10:52</p> <p>4 be hard pressed to say in every case. 10:53</p> <p>5 Q Okay. Well, in the context of controllers 10:53</p> <p>6 that are designed for memory modules, the controller 10:53</p> <p>7 which is controlling components on the memory module 10:53</p> <p>8 would have to be connected to those components; is 10:53</p> <p>9 that fair? 10:53</p> <p>10 A I just gave an example of wireless chargers 10:53</p> <p>11 for, let's say, a cell phone. A cell phone has 10:53</p> <p>12 memory. A controller is not connected to that cell 10:53</p> <p>13 phone as you say "connected." It's wirelessly 10:53</p> <p>14 influencing and controlling it. 10:53</p> <p>15 So you keep -- with this discussion, we're -- 10:53</p> <p>16 every instance is covered by your -- your request. I 10:54</p> <p>17 can't -- I can't acknowledge that every instance does 10:54</p> <p>18 what you say it does. 10:54</p> <p>19 MR. TEZYAN: Okay. Well, I'll object that 10:54</p> <p>20 that's nonresponsive, and I'll move to strike. 10:54</p> <p>21 Q So the question was: In the context of 10:54</p> <p>22 controllers that are designed for memory modules, the 10:54</p> <p>23 controller which is controlling components on the 10:54</p> <p>24 memory module would have to be connected to those 10:54</p> <p>25 components; is that fair? 10:54</p> <p style="text-align: right;">Page 38</p>	<p>1 And this is the start of Media Unit No. 3. 11:15</p> <p>2 MR. TEZYAN: Welcome back, Dr. Stone. 11:15</p> <p>3 Q Did you have any communications with counsel 11:15</p> <p>4 during the break? 11:15</p> <p>5 A I did not. 11:15</p> <p>6 Q You've been retained by Micron as an expert 11:15</p> <p>7 in this case; right? 11:15</p> <p>8 A That's correct. 11:15</p> <p>9 Q And you've been retained to opine on 11:15</p> <p>10 technology that's present in certain patents invented 11:15</p> <p>11 by Netlist? 11:15</p> <p>12 A Yes, it's correct. I -- I should look at my 11:15</p> <p>13 retention letter if it -- if it matters exactly what 11:15</p> <p>14 the details, but that's the general gist of my 11:15</p> <p>15 retention. 11:15</p> <p>16 Q This isn't the first time you've been adverse 11:15</p> <p>17 to Netlist; is that fair? 11:15</p> <p>18 A To Netlist, yes. I'll say yes to Netlist. 11:16</p> <p>19 Q That's yes, you've been adverse to Netlist in 11:16</p> <p>20 the past? 11:16</p> <p>21 A Not exactly. I think the patents in question 11:16</p> <p>22 were owned by another party. The -- the patents may 11:16</p> <p>23 have inventors who were Netlist inventors. The 11:16</p> <p>24 parties involved did not involve Netlist. 11:16</p> <p>25 Q Okay. Let's go down to PDF page 30 of your 11:16</p> <p style="text-align: right;">Page 40</p>
<p>1 A You said now -- 10:54</p> <p>2 MR. RUECKHEIM: Objection to the form. 10:54</p> <p>3 You can answer. 10:54</p> <p>4 THE WITNESS: Your question says now the 10:54</p> <p>5 controller is on the memory module; is that correct? 10:54</p> <p>6 MR. TEZYAN: Yes. 10:54</p> <p>7 THE WITNESS: In that instance, it is fair to 10:54</p> <p>8 say that that memory controller on the memory module 10:54</p> <p>9 is connected to the memory. 10:54</p> <p>10 MR. TEZYAN: I'm sorry. I think something 10:54</p> <p>11 got lost in translation there. 10:54</p> <p>12 Q So the question was -- and I'll just repeat 10:55</p> <p>13 it again: In the context of controllers that are 10:55</p> <p>14 designed for memory modules, the controller which is 10:55</p> <p>15 controlling components on the memory module would have 10:55</p> <p>16 to be connected to those components; fair? 10:55</p> <p>17 A I believe that's -- that's fair, yes. I 10:55</p> <p>18 would say that's fair. 10:55</p> <p>19 MR. TEZYAN: Okay. Let's take a break. 10:55</p> <p>20 THE VIDEOGRAPHER: We are going to go off the 10:55</p> <p>21 record. The time is 10:55 a.m. 10:55</p> <p>22 And this is the end of Media Unit No. 2. 10:55</p> <p>23 (Recess taken.) 10:55</p> <p>24 THE VIDEOGRAPHER: We are going back on the 11:15</p> <p>25 record. The time is 11:15 a.m. 11:15</p> <p style="text-align: right;">Page 39</p>	<p>1 declaration. That's Exhibit 1. 11:16</p> <p>2 A Okay. 11:16</p> <p>3 Q And at the very bottom of PDF page 30, 11:16</p> <p>4 there's a number of IPRs listed there. And then it 11:17</p> <p>5 says: 11:17</p> <p>6 "SK hynix v. Netlist, testifying for 11:17</p> <p>7 SK hynix." 11:17</p> <p>8 Do you see that? 11:17</p> <p>9 A I don't see it yet. It's reloading. It will 11:17</p> <p>10 come up shortly. It's still loading. 11:17</p> <p>11 Q And since we'll be coming back to your 11:18</p> <p>12 declaration throughout the day, it might just be more 11:18</p> <p>13 efficient to download it just so you have a local copy 11:18</p> <p>14 that you can come back to. 11:18</p> <p>15 A Okay. And what do -- you want me to download 11:18</p> <p>16 this one? I don't see a click -- a way to click on it 11:18</p> <p>17 to download it. 11:18</p> <p>18 Q It should be in the top right corner. 11:18</p> <p>19 THE VIDEOGRAPHER: Counsel, if he's using the 11:18</p> <p>20 guest version, he can't download. 11:18</p> <p>21 MR. TEZYAN: Okay. 11:18</p> <p>22 THE WITNESS: Oh, the upper-right corner? 11:18</p> <p>23 There is a -- let's see what I have. 11:18</p> <p>24 Ah, I got it. Okay. So I clicked on it, but 11:18</p> <p>25 it just brought it up. Okay. I -- I have not 11:18</p> <p style="text-align: right;">Page 41</p>

<p>1 downloaded, but I see it now. 11:18</p> <p>2 MR. TEZYAN: Okay. 11:18</p> <p>3 Q And you're at the bottom of PDF page 30; is 11:18</p> <p>4 that right? 11:18</p> <p>5 A I'll have to get there. 11:18</p> <p>6 I'm on page 30. My page 30 is my -- is my 11:19</p> <p>7 CV. 11:19</p> <p>8 Q Right. 11:19</p> <p>9 And at the bottom, it -- it says: 11:19</p> <p>10 "Consultantships." 11:19</p> <p>11 And it lists a number of cases that you've 11:19</p> <p>12 worked on in the past; is that right? 11:19</p> <p>13 A That's correct. That's correct. 11:19</p> <p>14 Q And it lists that you were an expert 11:19</p> <p>15 consultant working on a number of IPRs for the Sidley 11:19</p> <p>16 Austin firm; is that right? 11:19</p> <p>17 A That's correct. 11:19</p> <p>18 Q And sort of near the bottom, you see it says: 11:19</p> <p>19 "SK hynix v. Netlist, testifying for 11:19</p> <p>20 SK hynix." 11:19</p> <p>21 And before that, there are six IPR numbers 11:19</p> <p>22 listed? 11:19</p> <p>23 A Yes. All right. 11:19</p> <p>24 There was an interesting thing that happened 11:19</p> <p>25 in that case. The ownership -- as I recall, the 11:19</p> <p style="text-align: right;">Page 42</p>	<p>1 (Document remotely marked Exhibit 7 11:21</p> <p>2 for identification.) 11:21</p> <p>3 THE WITNESS: Okay. Oh. 11:21</p> <p>4 MR. TEZYAN: Q. Let me know when you have 11:21</p> <p>5 it. 11:22</p> <p>6 A It's coming. It's one of these things that 11:22</p> <p>7 take a while. It just produced that error message or 11:22</p> <p>8 the wording message that the file preview may take a 11:22</p> <p>9 while. 11:22</p> <p>10 Q While that's loading, sir, I believe you 11:23</p> <p>11 testified earlier that in preparation for this 11:23</p> <p>12 deposition, you had reviewed the parties' briefs 11:23</p> <p>13 submitted in this case; is that correct? 11:23</p> <p>14 A That's correct. That's the reply brief that 11:23</p> <p>15 says you can -- just a moment. It says the file 11:23</p> <p>16 preview generation is still in progress. You can stay 11:24</p> <p>17 on this page and keep retrying, or exit preview and 11:24</p> <p>18 return at a later time. It gives me a button called 11:24</p> <p>19 reload. 11:24</p> <p>20 Shall -- what shall I do? 11:24</p> <p>21 MR. TEZYAN: Can the tech please advise? 11:24</p> <p>22 THE WITNESS: I'm sorry. Say again, please. 11:24</p> <p>23 THE VIDEOGRAPHER: Yeah, I mean, this is kind 11:24</p> <p>24 of what I was talking about. His computer is just 11:24</p> <p>25 slow. So, I mean, if you want to screen share certain 11:24</p> <p style="text-align: right;">Page 44</p>
<p>1 patents got changed. Initially, it was a tribe, or at 11:19</p> <p>2 some point it was a tribe. So I -- I -- this is what 11:19</p> <p>3 I was thinking about. The patents were -- were 11:20</p> <p>4 Netlist type of patents. 11:20</p> <p>5 But you see -- oh, down on beginning of 11:20</p> <p>6 page 3, it says: 11:20</p> <p>7 "Microsoft v. St. Regis Tribe." 11:20</p> <p>8 That was also involved somewhere along the 11:20</p> <p>9 line. 11:20</p> <p>10 So I was testifying for SK hynix at the IPR 11:20</p> <p>11 as a petitioner, and the patent owner was Netlist. 11:20</p> <p>12 That's correct. 11:20</p> <p>13 Q Okay. So just to re-ask my question for 11:20</p> <p>14 clarity of the record, you've been adverse to Netlist 11:20</p> <p>15 on several occasions in the past; correct? 11:20</p> <p>16 A Let's just say that I've been adverse to 11:20</p> <p>17 Netlist on occasions according to my consultantships. 11:20</p> <p>18 I can't -- I don't want to use the word "several" or 11:20</p> <p>19 "few" or "any." Just -- the facts are in the 11:20</p> <p>20 curriculum vitae. 11:21</p> <p>21 Q Okay. And one of the proceedings listed in 11:21</p> <p>22 your CV is "IPR 2018-00363"; correct? 11:21</p> <p>23 A Yes. 11:21</p> <p>24 MR. TEZYAN: Okay. Go ahead and refresh your 11:21</p> <p>25 Exhibit Share for me. I've marked Exhibit 7. 11:21</p> <p style="text-align: right;">Page 43</p>	<p>1 documents that are larger, it might just be faster to 11:24</p> <p>2 do that. 11:24</p> <p>3 THE WITNESS: To -- to download? 11:24</p> <p>4 MR. TEZYAN: All right. 11:24</p> <p>5 I'll go ahead and screen share this one. 11:24</p> <p>6 Well, you know what? Let's go off the record 11:24</p> <p>7 for a second. 11:24</p> <p>8 THE WITNESS: Okay. 11:24</p> <p>9 MR. RUECKHEIM: That's fine. 11:24</p> <p>10 THE VIDEOGRAPHER: We are going off the 11:24</p> <p>11 record. The time is 11:24 a.m. 11:24</p> <p>12 And this is the end of Media Unit No. 3. 11:24</p> <p>13 (Recess taken.) 11:25</p> <p>14 THE VIDEOGRAPHER: We are going back on the 11:29</p> <p>15 record. The time is 11:29 a.m. 11:29</p> <p>16 And this is the start of Media Unit No. 4. 11:29</p> <p>17 MR. TEZYAN: Q. So do you recognize 11:29</p> <p>18 Exhibit 7, Dr. Stone? 11:29</p> <p>19 A I do. 11:29</p> <p>20 Q And Exhibit 7 is a declaration you submitted 11:29</p> <p>21 in IPR2018-00363; is that correct? 11:29</p> <p>22 A That is correct. 11:30</p> <p>23 Q And I think before the break, I had asked you 11:30</p> <p>24 if you had reviewed the parties' briefs in this case 11:30</p> <p>25 in preparation for your deposition. 11:30</p> <p style="text-align: right;">Page 45</p>



1 But just to be more specific, have you 11:30	1 to the lower figure? 11:33
2 reviewed Micron's responsive brief as well? 11:30	2 Q Oh, to the upper figure, sir. 11:33
3 A I have reviewed Micron's responsive brief, 11:30	3 A I see that. 11:33
4 yes. 11:30	4 Q Okay. And then you have sort of in 11:33
5 Q Okay. So you understand that one of the 11:30	5 light-shaded blue a data path that goes below A and 11:33
6 issues in this case is whether the '339 patent is 11:30	6 that's labeled "B"; right? 11:33
7 directed to what's called a "fork in the road"; right? 11:30	7 A I see the path. What did you say the label 11:33
8 A That's correct. 11:30	8 was? 11:33
9 MR. RUECKHEIM: Objection to form. 11:30	9 Q Oh, it's labeled "B." 11:33
10 MR. TEZYAN: Q. And that's an issue you've 11:30	10 A I see the B. It's okay. 11:33
11 encountered before; right? 11:30	11 Q Okay. 11:33
12 A That's correct. 11:30	12 A I see. 11:33
13 Q Okay. And if we can jump to paragraph 63 of 11:30	13 Q So we have data path A and data path B; 11:33
14 this declaration, sir. Let me know when you're there. 11:30	14 right? 11:33
15 A I have -- I've got the wrong one. 11:31	15 Just trying to set the table. We -- we both 11:33
16 Q It's on PDF page -- 11:31	16 have a common understanding of this figure. We have 11:33
17 A Exhibit 7. I've got it. 11:31	17 data path A and data path B; right? 11:33
18 Q Okay. 11:31	18 MR. RUECKHEIM: Object to the form; beyond 11:33
19 A Okay. Now, we're going to paragraph what? 11:31	19 the scope. 11:33
20 Q Paragraph 63. It's on PDF page 30. 11:31	20 THE WITNESS: I -- I have to see the context. 11:33
21 A I've got -- let's see. I have paragraph 63. 11:31	21 I'm -- I'm struggling, because A and B are connected. 11:34
22 Q Okay. And here, it says the word -- the 11:31	22 Usually when you have a separate data path, there is 11:34
23 phrase "fork in the road" is used: 11:31	23 an intermediate component. 11:34
24 "As a non-technical shorthand to refer to 11:31	24 MR. TEZYAN: Okay. 11:34
25 this switching action by data transmission circuit 416 11:31	25 Q But you see that there is this triangle 11:34
Page 46	Page 48
1 between data path A and data path B." 11:31	1 labeled 504; right? 11:34
2 Do you see that? 11:31	2 A I do. 11:34
3 And it's referring to data path A and data 11:31	3 Q And triangle 504 is a tristate buffer; right? 11:34
4 path B in Figure 5 that's on the next page. 11:31	4 MR. RUECKHEIM: Object to the form; beyond 11:34
5 A Okay. I understand that in prior litigation 11:31	5 the scope. 11:34
6 between the parties involving the '185 patent, which 11:31	6 THE WITNESS: Yeah, 504 is a tristate buffer. 11:34
7 is the parent to the '907 patent, they used the phrase 11:32	7 MR. TEZYAN: Okay. 11:34
8 "fork in the road." Okay. I see that. 11:32	8 Q And 506 is a tristate buffer as well; right? 11:34
9 Q And do you see Figure 5 below on the next 11:32	9 A I believe that's the case. 11:34
10 page? 11:32	10 Q Okay. And the tristate buffer in data 11:34
11 A Yes, I see Figure 5. 11:32	11 path B, that's tristate buffer 506, has an X through 11:34
12 Q And do you see the blue arrow going through 11:32	12 it; right? 11:34
13 what is data path A that connects to terminal Y1? 11:32	13 A This is not completely clear to me, because 11:34
14 A I do. 11:32	14 there are three things that you were referring to by 11:35
15 Q And then the data path extending from 11:32	15 saying "X." There is an input to X, there is X, and 11:35
16 terminal Y1 to "Memory Ranks A, C"? 11:32	16 the output. And I'm -- your question is not clear to 11:35
17 MR. RUECKHEIM: Object to the form; beyond 11:32	17 me as to what is what. 11:35
18 the scope. 11:32	18 Q Okay. Well, why don't we jump to 11:35
19 THE WITNESS: No. There are two parts of a 11:32	19 paragraph 64, and that's on PDF page 32. 11:35
20 figure here. You have to help me. 11:32	20 A Okay. 11:35
21 Repeat your question again, please. 11:32	21 Q And it says: 11:35
22 MR. TEZYAN: Q. Oh, I'm just asking if you 11:32	22 "When the control logic circuitry 502 11:35
23 see that the data path extends from terminal Y1 to 11:32	23 receives" -- "an 'enable A' signal, a first tristate 11:35
24 Memory Ranks A and C? 11:33	24 buffer 504 in path A" -- "is enabled and actively 11:35
25 A And you're referring to the upper figure or 11:33	25 drives the data value on its output, while a second 11:35
Page 47	Page 49



<p>1 tristate buffer 506 in path B is disabled with its 11:35</p> <p>2 output in a high impedance condition." 11:35</p> <p>3 Did I read that correctly? 11:36</p> <p>4 A I believe you have. I'm -- I'm reading it 11:36</p> <p>5 again just to make sure I got all the words. 11:36</p> <p>6 Q Yeah, take your time. 11:36</p> <p>7 A I understand. Okay. You -- I believe you 11:36</p> <p>8 read it correctly, but let's go ahead. 11:36</p> <p>9 Q Okay. And returning to that annotated 11:36</p> <p>10 version of Figure 5 that appears on PDF page 31 of 11:36</p> <p>11 your declaration. 11:36</p> <p>12 A Okay. 11:36</p> <p>13 Q The -- sorry. Withdraw. 11:36</p> <p>14 So data paths A and B are two prongs of the 11:36</p> <p>15 fork in the road; right? 11:37</p> <p>16 MR. RUECKHEIM: Object to the form, and 11:37</p> <p>17 beyond the scope. 11:37</p> <p>18 And Counsel, Dr. Stone has not opined on the 11:37</p> <p>19 '339 patent that involves the fork in the road. Can 11:37</p> <p>20 you confirm your questions have nothing to do with his 11:37</p> <p>21 claim construction declaration for the record? 11:37</p> <p>22 MR. TEZYAN: Counsel, I'm going to read to 11:37</p> <p>23 you Local Rule CV 30, and that says: 11:37</p> <p>24 "Objections to questions during the oral 11:37</p> <p>25 deposition are limited to objection; leading and 11:37</p> <p style="text-align: right;">Page 50</p>	<p>1 received, the first tristate 504 opens path A and the 11:39</p> <p>2 second tristate 506 closes path B" -- "thus directing 11:39</p> <p>3 the data to a second terminal Y2." 11:39</p> <p>4 Okay. Let's just stop there, and I'll go 11:39</p> <p>5 back to the figure. And we're going to the figure. 11:39</p> <p>6 So according to that reading, the second path 11:39</p> <p>7 on that fork comprises the part that is the input to 11:39</p> <p>8 the tristate driver that has an X on it, and continues 11:39</p> <p>9 through Y2, and then onto the Memory Ranks 452. 11:39</p> <p>10 That's the path. And the 506 interrupts the path. 11:40</p> <p>11 Now, your question -- if you can repeat your 11:40</p> <p>12 question, I can try again to answer it. 11:40</p> <p>13 Q Sure. 11:40</p> <p>14 The question was just: Are A and B the two 11:40</p> <p>15 prongs in the fork in the road that the parties 11:40</p> <p>16 previously have used as a shorthand for that switching 11:40</p> <p>17 action between paths A and B? 11:40</p> <p>18 MR. RUECKHEIM: Object to the form. 11:40</p> <p>19 THE WITNESS: I have difficulty, because B is 11:40</p> <p>20 part of a path. And when you say "prong," I don't -- 11:40</p> <p>21 I am uncertain if you mean the whole path, which is 11:40</p> <p>22 what the patent talks about, or just the little bit 11:40</p> <p>23 that goes to the tristate driver with the X. 11:40</p> <p>24 If you talk about prongs, I -- reading the 11:41</p> <p>25 patent, I would believe you're talking about paths, 11:41</p> <p style="text-align: right;">Page 52</p>
<p>1 objection; form." 11:37</p> <p>2 Going forward, I'd appreciate it if you 11:37</p> <p>3 complied with that rule. 11:37</p> <p>4 MR. RUECKHEIM: Understood. 11:37</p> <p>5 Dr. Stone, you can answer this question. 11:37</p> <p>6 Then we'll take a break, and we can talk offline. 11:37</p> <p>7 THE WITNESS: Did you say I can answer the 11:37</p> <p>8 question, and then -- 11:37</p> <p>9 MR. RUECKHEIM: If you can. 11:37</p> <p>10 THE WITNESS: Okay. Would you ask the 11:37</p> <p>11 question again? 11:37</p> <p>12 MR. TEZYAN: Sure. 11:37</p> <p>13 Q The question was: Data path A and B are two 11:37</p> <p>14 prongs of the fork in the road; right? 11:38</p> <p>15 And if you need to remind yourself, you can 11:38</p> <p>16 go ahead and review paragraph 63 of your declaration. 11:38</p> <p>17 A Did your question end at that point? 11:38</p> <p>18 I'm sorry. You're -- you're asking me that A 11:38</p> <p>19 and B are two -- two prongs of the fork; is that 11:38</p> <p>20 correct? 11:38</p> <p>21 Q Yes, sir. 11:38</p> <p>22 A Okay. My reading of my declaration is 11:38</p> <p>23 informed by the end of paragraph 64. And I'm looking 11:38</p> <p>24 at the fifth line, a sentence that begins "similarly": 11:38</p> <p>25 "Similarly, if an 'enable B' signal is 11:39</p> <p style="text-align: right;">Page 51</p>	<p>1 but I don't know. I can't -- can't -- I can't answer 11:41</p> <p>2 your question. 11:41</p> <p>3 MR. TEZYAN: Sure. Sure. 11:41</p> <p>4 Q If you could answer the question assuming I 11:41</p> <p>5 mean paths. 11:41</p> <p>6 So are -- are A and B two different paths in 11:41</p> <p>7 that fork? 11:41</p> <p>8 A A -- 11:41</p> <p>9 MR. RUECKHEIM: Same objection. 11:41</p> <p>10 THE WITNESS: -- A is the path that goes to 11:41</p> <p>11 the memory and includes the part that goes to the 11:41</p> <p>12 memory. B is the path that goes to Memory Ranks B and 11:41</p> <p>13 D and includes that part. Those two are paths. 11:41</p> <p>14 MR. TEZYAN: Okay. 11:41</p> <p>15 MR. RUECKHEIM: We can break. 11:41</p> <p>16 MR. TEZYAN: No. 11:41</p> <p>17 MR. RUECKHEIM: We can go off the record 11:41</p> <p>18 right now. 11:41</p> <p>19 THE VIDEOGRAPHER: We need both parties to -- 11:41</p> <p>20 MR. TEZYAN: I'm going to jump to his actual 11:41</p> <p>21 declaration now in this action. So if we could just 11:41</p> <p>22 go to that real quick. 11:41</p> <p>23 MR. RUECKHEIM: Understood. Go ahead. 11:42</p> <p>24 MR. TEZYAN: Okay. 11:42</p> <p>25 Q Dr. Stone, can you go back to Exhibit 1, 11:42</p> <p style="text-align: right;">Page 53</p>

1 please? 11:42	1 load will the memory controller experience? 11:45
2 A Okay. I was -- go back to what? 11:42	2 MR. RUECKHEIM: Object to the form. 11:45
3 Q Exhibit No. 1, sir, your -- 11:42	3 THE WITNESS: The -- I -- I can't answer that 11:45
4 A Exhibit No. 1. 11:42	4 without knowing the way the memory controller is wired 11:45
5 Q -- declaration for this -- 11:42	5 to the various receivers. I -- I can't answer it 11:45
6 A Okay. 11:42	6 because I don't know anything about the structure of 11:45
7 Q -- claim construction brief. 11:42	7 the interconnect. 11:45
8 A Got it. Okay. 11:42	8 MR. TEZYAN: Okay. 11:45
9 Q And can you go to paragraph 25, please. 11:42	9 Q But the memory controller during a write 11:45
10 A Just a moment. There's my declaration. 11:42	10 operation will at least experience some load as a 11:45
11 25 paragraph? 11:42	11 result of -- or -- sorry. Let me withdraw the 11:45
12 Q Yeah. It's on PDF page 10. 11:42	12 question. 11:45
13 A I have it. 11:42	13 The memory controller during a write 11:45
14 Q Okay. So you say that a person of ordinary 11:42	14 operation will experience at least some load due to 11:45
15 skill in the art would have been familiar with 11:42	15 the memory devices; is that fair? 11:45
16 standardized DRAM, SDRAM memory devices, memory 11:43	16 A You know, it depends on the context. 11:45
17 modules, and how they interacted with the memory 11:43	17 And the issue is, if it's capacitive load 11:45
18 controller and other parts of a computer system. 11:43	18 you're talking about, it may not matter about the 11:45
19 Do I have that right? 11:43	19 memory devices, per se. It's the path that's taken by 11:45
20 A You have that correct. 11:43	20 the signal. 11:46
21 Q Okay. So what is load? 11:43	21 If it's current load that you're talking 11:46
22 A Load has variable meanings, multiple 11:43	22 about, then it does depend on the memory device that 11:46
23 meanings, and you have to determine what load means 11:43	23 receives the current. 11:46
24 from the context in which you use it. 11:43	24 So I can't answer your question as asked. 11:46
25 Q Okay. Fair enough. 11:43	25 Q Okay. So you say for capacitive load, it may 11:46
Page 54	Page 56
1 What would a person of ordinary skill in the 11:43	1 depend on the path that's taken by the signal. 11:46
2 art understand the word "load" to mean in the context 11:43	2 What do you mean by that? 11:46
3 of a memory module that's connected to a memory 11:43	3 A The memory controller -- let's take one 11:46
4 controller of a computer system? 11:43	4 driver. Okay. The driver is connected to the memory 11:46
5 A Just -- you just know it's a memory module 11:43	5 through metal, usually on a chip itself. There may be 11:46
6 and that there is load. There are multiple meanings. 11:43	6 other ways of making the connection. 11:46
7 The load could be capacitive load, and the load could 11:43	7 All of those things that are connected to the 11:46
8 be also a current load. 11:44	8 driver have capacitance with respect to ground or with 11:46
9 Q Okay. But the memory devices -- I'm sorry. 11:44	9 respect to the surroundings. 11:46
10 Let me withdraw. 11:44	10 What I mean by the driver has to drive that 11:46
11 And I'll ask: The memory controller will 11:44	11 capacitive load, I mean that if you start with the 11:47
12 experience some sort of load as the result of the 11:44	12 conductor at 0 volts, and you're trying to raise it to 11:47
13 memory devices that are on the memory module; right? 11:44	13 a higher voltage, you have to charge that inductor. 11:47
14 A That's correct. 11:44	14 And it doesn't matter if the inductor is tied to the 11:47
15 Q For example, during a write operation, the 11:44	15 memory cell end or if it's a stub or where it goes. 11:47
16 memory controller will see the load of all of the 11:44	16 It starts at 0 volts. You have to charge the entire 11:47
17 memory devices that are on the memory module, right, 11:44	17 conductor. 11:47
18 in the absence of some sort of buffer? 11:44	18 That's what I mean. 11:47
19 A I -- I can't agree with that. I mean, it 11:44	19 Q Okay. So let's assume we have a memory 11:47
20 would -- you said all the memory devices that are on 11:44	20 module that has four memory devices on it. Okay. 11:48
21 the buffer -- I -- I -- repeat your question. 11:44	21 Then during a write operation, does the 11:48
22 Q Sure. 11:44	22 memory controller see the load of all four of those 11:48
23 The question is: During a write operation -- 11:44	23 memory devices? 11:48
24 well, let me just withdraw. 11:44	24 A It depends how you wire it, but the answer 11:48
25 And I'll ask: During a write operation, what 11:44	25 could be yes. 11:48
Page 55	Page 57

<p>1 Q Why does it depend how you wire it? 11:48</p> <p>2 A Well, okay. Let's suppose that one of those 11:48</p> <p>3 four devices is active. Okay. And the other three 11:48</p> <p>4 devices are inactive. Okay. 11:48</p> <p>5 The inactive device has a load. It may be 11:48</p> <p>6 infinite; it may be some small resistance. Okay. 11:48</p> <p>7 Whatever it is, it's a load. 11:48</p> <p>8 A transmission wave comes down, and it 11:48</p> <p>9 touches all four devices if they're connected, even 11:48</p> <p>10 though only three are going to respond. That 11:48</p> <p>11 transmission wave will bounce back from all of those 11:49</p> <p>12 devices, and then it will be reflected back again, 11:49</p> <p>13 back and forth and back and forth and back and forth, 11:49</p> <p>14 until it dies out. 11:49</p> <p>15 What will happen is that the device that you 11:49</p> <p>16 want to send the wave will see noise in the terms of 11:49</p> <p>17 the reflections. 11:49</p> <p>18 Now, if you take those three devices off the 11:49</p> <p>19 transmission line and don't have them connected at 11:49</p> <p>20 all, if they're gone, the receiving device will see a 11:49</p> <p>21 different signal. 11:49</p> <p>22 So the -- even though the devices aren't 11:49</p> <p>23 going to respond, they load the transmission line. 11:49</p> <p>24 Q Understood. 11:49</p> <p>25 So how would you take those three devices off 11:49</p> <p style="text-align: right;">Page 58</p>	<p>1 Q Well, say those signal reflections weren't 11:51</p> <p>2 there. Would there be less noise? 11:51</p> <p>3 A The -- you can't get around that. They're 11:51</p> <p>4 going to -- this is physics. There will be 11:51</p> <p>5 reflection. 11:51</p> <p>6 Q I'm saying if -- if those inactive devices 11:51</p> <p>7 aren't -- aren't there. 11:51</p> <p>8 A You'll still see reflections, but not from 11:51</p> <p>9 them. 11:51</p> <p>10 Q Okay. 11:51</p> <p>11 A Can we go to my vitae? 11:51</p> <p>12 Q What's that? 11:51</p> <p>13 We can return to that at a later time. 11:51</p> <p>14 Sorry. I'm -- 11:51</p> <p>15 A Okay. 11:51</p> <p>16 Q -- on the particular line of questioning I'd 11:51</p> <p>17 like to finish. Okay. 11:51</p> <p>18 And in your declaration, paragraph 25, you 11:52</p> <p>19 also note that a person of skill in the art would have 11:52</p> <p>20 been familiar with industry standards such as JEDEC 11:52</p> <p>21 and particular DRAM standards, I take it; is that 11:52</p> <p>22 fair? 11:52</p> <p>23 A Let me see. 11:52</p> <p>24 You quoted that -- either you quoted it 11:52</p> <p>25 exactly or you got the intent of it. It's fair. 11:52</p> <p style="text-align: right;">Page 60</p>
<p>1 of the transmission line? 11:49</p> <p>2 A I was just giving an example. Okay. You 11:49</p> <p>3 might not wire them on a transmission line. I was 11:49</p> <p>4 trying to tell you the effect of having these devices 11:50</p> <p>5 that aren't going to respond to the signal be part of 11:50</p> <p>6 the load. I just gave you the example. Okay. 11:50</p> <p>7 I would like you to -- to bring up my 11:50</p> <p>8 curriculum vitae. It's at the end of my -- my report. 11:50</p> <p>9 Go ahead. My report is up now; isn't it? 11:50</p> <p>10 Q We can return to that in a moment, Dr. Stone. 11:50</p> <p>11 I'm just trying to understand something here. 11:50</p> <p>12 So in the absence of those reflections on the 11:50</p> <p>13 signal line from the three inactive memory devices, is 11:50</p> <p>14 the signal integrity of the signal to the active 11:50</p> <p>15 memory device higher? 11:50</p> <p>16 MR. RUECKHEIM: Object to the form. 11:50</p> <p>17 THE WITNESS: I -- I -- I'm sorry. The -- I 11:50</p> <p>18 didn't talk about integrity. I don't know what you 11:50</p> <p>19 mean by "integrity." 11:50</p> <p>20 I'm telling you that the reflections will 11:50</p> <p>21 cause noise. The noise will be different if you have 11:50</p> <p>22 devices on the line that aren't responding. Or if you 11:50</p> <p>23 don't have the devices on the line at all, you will 11:51</p> <p>24 see different noise. 11:51</p> <p>25 MR. TEZYAN: Okay. 11:51</p> <p style="text-align: right;">Page 59</p>	<p>1 Q Okay. And DRAM devices can be organized in 11:53</p> <p>2 what JEDEC calls ranks; right? 11:53</p> <p>3 A G -- what does JEDEC call it? 11:53</p> <p>4 Q Let me rephrase the question. 11:53</p> <p>5 Memory devices can be grouped in what are 11:53</p> <p>6 called ranks; right? 11:53</p> <p>7 And specifically, DRAM devices can be grouped 11:53</p> <p>8 in ranks; is that fair? 11:53</p> <p>9 MR. RUECKHEIM: Object to the form. 11:53</p> <p>10 THE WITNESS: Yeah, the -- ranks do refer to 11:53</p> <p>11 structures com- -- comprising DRAMs. 11:53</p> <p>12 MR. TEZYAN: Okay. 11:53</p> <p>13 Q You're familiar with the term "rank"; right? 11:53</p> <p>14 A I am familiar with the term. 11:53</p> <p>15 Q Okay. Have you ever heard the term "rank" 11:53</p> <p>16 used to refer to NAND memory? 11:53</p> <p>17 MR. RUECKHEIM: Object to the form. 11:53</p> <p>18 THE WITNESS: I built such a memory. The 11:53</p> <p>19 answer is yes. 11:54</p> <p>20 MR. TEZYAN: Q. But did you specifically 11:54</p> <p>21 refer to the NAND devices there as ranks of NAND 11:54</p> <p>22 devices? 11:54</p> <p>23 A Let me give you a citation. I don't have it 11:54</p> <p>24 in front of me. But the answer is, it would be in 11:54</p> <p>25 that citation. If we may pull up my vitae. It's -- 11:54</p> <p style="text-align: right;">Page 61</p>

<p>1 it's actually in my declaration. I'll show you the 11:54  2 reference. 11:54  3 Q Okay. Let me know. 11:54  4 A So okay. Okay. 11:54  5 In my vitae on page 8, which is PDF file -- 11:55  6 this is my declaration. It's 36 of the PDF file. 11:55  7 Q Uh-huh. 11:55  8 A Okay. And particularly, I'm looking at 11:55  9 reference 4, a book I wrote called "Microcomputer 11:55  10 Interfacing." In that book, it shows the structure of 11:55  11 a memory system and has four ranks. I don't recall if 11:55  12 I called them ranks. A structure is what people would 11:55  13 call a rank today. 11:56  14 Q And why is that? 11:56  15 MR. RUECKHEIM: Object to the form. 11:56  16 MR. TEZYAN: Let me rephrase the question. 11:56  17 Q Why would the structure of what you say is in 11:56  18 the "Microcomputer Interfacing" book be commonly -- 11:56  19 I'm sorry. Let me just -- bad question. 11:56  20 Okay. What is the structure of a rank? 11:56  21 MR. RUECKHEIM: Object to the form. 11:56  22 THE WITNESS: Well, let me just say, I'll -- 11:56  23 I'll describe what's there and how it relates to the 11:56  24 JEDEC standard. 11:56  25 There's 32 memory cells -- memory chips. 11:56  Page 62</p>	<p>1 Q Sure. 11:58  2 Are you familiar with what a chip select 11:58  3 signal is? 11:58  4 A I am. 11:58  5 Q What is a chip select signal? 11:58  6 A Again, this depends on the context, and the 11:58  7 context has varied in time. 11:58  8 Generally, a chip select signal is a signal 11:58  9 that enables a chip to react. In various 11:58  10 implementations, a chip select signal would be sent on 11:59  11 a bus from a controller. Subsequently, chip selects 11:59  12 might not be produced on a bus, and they might be 11:59  13 produced locally in other ways, and they may be given 11:59  14 other names. 11:59  15 But the whole idea of a chip select is when 11:59  16 it's present, it says, "I am selecting you." Some 11:59  17 devices may require two, both present. But basically, 11:59  18 the idea is, "I want you to act." And if it's not 11:59  19 active, it says, "I don't want you to act." That's 11:59  20 the idea. 11:59  21 Q Are chip select signals unique to DRAM? 11:59  22 A No. 11:59  23 Q Chip select signals are used in other 11:59  24 applications as well? 11:59  25 A I have chip selects in my book, and it's 12:00  Page 64</p>
<p>1 They're arranged in four rows. Each row responds by 11:56  2 writing 8 bits or producing 8 bits on a read command. 11:56  3 Each row is separately enabled when they're active. 11:57  4 Now, if we bring up the JEDEC standard, 11:57  5 you'll see that the JEDEC DIMMS behave similarly. 11:57  6 And if you get to places where people 11:57  7 describe ranks, a person of ordinary -- ordinary skill 11:57  8 in the art would look at this -- at my -- my design 11:57  9 and say, "That's four ranks." And they look at JEDEC 11:57  10 and they say, "Yes, those are ranks," regardless of 11:57  11 whether the text says it's a rank or not, because that 11:57  12 is the view that a person of ordinary skill in the art 11:57  13 would have when you align four rows of eight chips 11:57  14 each, and you enable one row at a time. That's what a 11:57  15 person of ordinary skill would call a rank. 11:57  16 MR. TEZYAN: Q. So regardless of the type of 11:57  17 memory that's being used, as long as there are 11:58  18 multiple chips in a row, and you can enable one row at 11:58  19 a time, that's a rank? 11:58  20 MR. RUECKHEIM: Object to the form. 11:58  21 THE WITNESS: It's my testimony that a person 11:58  22 of ordinary skill would call that a rank in my book. 11:58  23 MR. TEZYAN: Q. Are you familiar with what a 11:58  24 chip select signal is? 11:58  25 A Can you repeat your question? 11:58  Page 63</p>	<p>1 dated 1982. 12:00  2 Q Do you recall when DRAM first came out? 12:00  3 A I -- I -- I can't give you the exact year. 12:00  4 But in my book, I describe both SRAM, which 12:00  5 is static RAM, which requires constant -- constant 12:00  6 voltage to maintain the -- the state, and it also 12:01  7 describes DRAM, which requires refresh to maintain the 12:01  8 state. And that was 1982. It describes the static 12:01  9 RAM has chip select and DRAM has chip select. So 12:01  10 sometime prior to 1982, you could get to DRAM. I 12:01  11 don't know when. 12:01  12 Q Okay. And you're familiar with the structure 12:01  13 of DRAM; right? 12:01  14 A I don't believe there is a unique structure 12:01  15 of DRAM. 12:01  16 Q Well, DRAM is comprised of memory cells; 12:01  17 right? 12:01  18 A The -- I'm -- I'm sorry. The original patent 12:02  19 on DRAM are -- I'm sorry. The original patent on 12:02  20 the -- on the DRAM cells we use was done at IBM, and 12:02  21 it's called a one-cell memory. And if you're talking 12:02  22 about, is that DRAM, the answer is yes. 12:02  23 And it's a -- I'm sorry. It's a 12:02  24 one-transistor cell. And so there's no plural. And 12:02  25 you asked your question in the plural. That's what's 12:02  Page 65</p>

<p>1 confusing to me. 12:02</p> <p>2 Q Okay. But a person of ordinary skill in the 12:02</p> <p>3 art, when hearing the term "DRAM," would understand 12:02</p> <p>4 that DRAM has memory cells; correct? 12:02</p> <p>5 MR. RUECKHEIM: Object to the form. 12:02</p> <p>6 THE WITNESS: The person -- I think I have to 12:02</p> <p>7 go to the context on this. 12:03</p> <p>8 Again, you used plural, and I -- it's -- is 12:03</p> <p>9 that correct? You said "memory cells"? 12:03</p> <p>10 MR. TEZYAN: Yes. 12:03</p> <p>11 Q The question was, would a person of 12:03</p> <p>12 ordinary -- 12:03</p> <p>13 A Yeah, that -- that's what bothers me. So I 12:03</p> <p>14 don't know. 12:03</p> <p>15 Q Okay. Aside from that implementation at IBM 12:03</p> <p>16 that you just discussed, are you aware of any other 12:03</p> <p>17 DRAM that's composed of just one memory cell? 12:03</p> <p>18 A Well, yes, I am, because FPGAs can be 12:03</p> <p>19 configured into one memory cell on an FPA -- FPGA, for 12:03</p> <p>20 example. So it wouldn't be in the plural. 12:03</p> <p>21 So no, I -- I still have difficulty with your 12:03</p> <p>22 question. 12:03</p> <p>23 Q Okay. So DRAM that would go inside a memory 12:03</p> <p>24 product is composed of DRAM cells; right? 12:04</p> <p>25 MR. RUECKHEIM: Object to the form. 12:04</p> <p style="text-align: right;">Page 66</p>	<p>1 sorry -- that a DRAM that goes into a product composed 12:05</p> <p>2 of memory cells? 12:06</p> <p>3 And I said there are -- there are situations 12:06</p> <p>4 and possibly not. And then I gave an example which 12:06</p> <p>5 are the registers, which you don't call memory cells. 12:06</p> <p>6 And -- okay. I can conceive of an FPGA going 12:06</p> <p>7 into a product, and that FPGA has registers in it, 12:06</p> <p>8 flip-flops, if you'd like, and they -- they do 12:06</p> <p>9 something. And you might not call them memory cells 12:06</p> <p>10 because they're not -- they're not compatible with 12:06</p> <p>11 JEDEC. All right. So I -- that's -- that's a 12:06</p> <p>12 possible way to interpret your question. 12:06</p> <p>13 And my answer would be yes, these things 12:06</p> <p>14 would not be DRAM -- necessarily DRAM memory. 12:06</p> <p>15 MR. TEZYAN: Okay. 12:06</p> <p>16 Q Let's go back to paragraph 25 of your 12:06</p> <p>17 declaration where you discuss -- or where you note 12:06</p> <p>18 that a person of ordinary skill in the art would have 12:07</p> <p>19 been familiar with standardized DRAM memory devices; 12:07</p> <p>20 fair? 12:07</p> <p>21 That's what it says there? 12:07</p> <p>22 A Yes. 12:07</p> <p>23 Q Okay. And those DRAM memory devices would 12:07</p> <p>24 have DRAM memory cells; right? 12:07</p> <p>25 MR. RUECKHEIM: Object to the form. 12:07</p> <p style="text-align: right;">Page 68</p>
<p>1 THE WITNESS: I would say the way you're 12:04</p> <p>2 offering that is if every instance is composed of 12:04</p> <p>3 memory cells. 12:04</p> <p>4 And I would say that it is the case that DRAM 12:04</p> <p>5 that goes into products in some cases, and maybe in 12:04</p> <p>6 many cases, has memory cells. I am not testifying 12:04</p> <p>7 that in every case, a DRAM that goes into a memory 12:04</p> <p>8 product has memory cells. 12:04</p> <p>9 MR. TEZYAN: Q. What would the memory be 12:04</p> <p>10 composed of in a DRAM product otherwise? 12:04</p> <p>11 MR. RUECKHEIM: Object to the form. 12:04</p> <p>12 THE WITNESS: Flip-flops. They not -- 12:04</p> <p>13 they're not necessarily called memory cells; they're 12:05</p> <p>14 flip-flops. 12:05</p> <p>15 MR. TEZYAN: Okay. 12:05</p> <p>16 Q So is it your testimony today that a DRAM die 12:05</p> <p>17 that goes into a memory product has no DRAM cells in 12:05</p> <p>18 it? 12:05</p> <p>19 A I didn't testify to that. 12:05</p> <p>20 Q Well, it sounds like you're saying that there 12:05</p> <p>21 can be DRAM that goes into DRAM products that is not 12:05</p> <p>22 composed of memory cells -- DRAM memory cells. 12:05</p> <p>23 MR. RUECKHEIM: Object to the form. 12:05</p> <p>24 THE WITNESS: I think you asked me that in 12:05</p> <p>25 every case, is a DRAM product that goes into a -- I'm 12:05</p> <p style="text-align: right;">Page 67</p>	<p>1 THE WITNESS: Okay. The answer is, if you -- 12:07</p> <p>2 if you're insisting that every instance would have 12:07</p> <p>3 memory cells, I don't know. 12:07</p> <p>4 If you're insisting that in -- in many cases 12:07</p> <p>5 or in some instances or whatever, those DRAM devices 12:07</p> <p>6 would have memory cells, my answer is yes. 12:07</p> <p>7 I'm just not able to say in every possible 12:07</p> <p>8 case. 12:08</p> <p>9 MR. TEZYAN: Q. Would a person of ordinary 12:08</p> <p>10 skill in the art at the time of these patents have 12:08</p> <p>11 been aware of JEDEC standardized memory devices that 12:08</p> <p>12 were 64 bits wide? 12:08</p> <p>13 A I'd have to check on the dates of the JEDEC 12:08</p> <p>14 standards. I'm not exactly sure when the 64-bit-wide 12:08</p> <p>15 JEDEC module was introduced. I believe that the DDR2 12:08</p> <p>16 predates the priority of the '918 patent. So I'd have 12:08</p> <p>17 to look at the DDR2 and see what width it has. 12:09</p> <p>18 Q Let me clarify my question a little bit. I 12:09</p> <p>19 meant 64-bit memory devices; so not the memory module 12:09</p> <p>20 itself, but the SDRAMs that are on the module. 12:09</p> <p>21 Would a person of ordinary skill in the art 12:09</p> <p>22 been aware of such memory devices? 12:09</p> <p>23 A I don't know when they were introduced. I 12:09</p> <p>24 didn't prepare for that. 12:09</p> <p>25 Q But you're referring to the memory module, 12:09</p> <p style="text-align: right;">Page 69</p>



1 right, not the individual SDRAMs, the chips? 12:09	1 That's an electronic version of a book I wrote that 13:03
2 A My answer was for the memory module. I 12:09	2 has the publication date of 1982. 13:03
3 didn't mention any JEDEC DDR2 standard. 12:09	3 Q And this was the book that you had referenced 13:03
4 Q Right. 12:09	4 earlier when I asked you for an example of using the 13:03
5 And my question is: Are you aware of any 12:09	5 term "rank" with reference to NAND memory; is that 13:03
6 SDRAM chips that are 64 bits wide? 12:09	6 right? 13:03
7 A I -- I don't know when they were first 12:09	7 A That's correct. 13:03
8 introduced. I can't -- I can't testify on that. 12:09	8 Q Can you show me where in this book that 13:03
9 MR. TEZYAN: Okay. It's 12:10. Why don't we 12:10	9 example is? 13:03
10 take a break for lunch, since it's around lunchtime on 12:10	10 A I can show you. And I will tell you in 13:03
11 the West Coast. 12:10	11 advance that it uses the word "bank" instead of 13:03
12 THE VIDEOGRAPHER: All right. 12:10	12 "rank," but let me find it for you. 13:03
13 MR. TEZYAN: Go off the record. 12:10	13 The figure that I have in mind appears on 13:03
14 THE VIDEOGRAPHER: We'll go off the record. 12:10	14 page 146 of the PDF file. 13:04
15 The time is 12:10 p.m. 12:10	15 Q Okay. And that's Figure 4-5; correct? 13:04
16 And it's the end of Media No. 4. 12:10	16 A That's correct. 13:04
17 (Lunch break taken at 12:10 p.m.) 12:10	17 Now, the use of the term "bank" -- let's see. 13:04
18 ---oOo---	18 I'll take a moment. 13:04
19	19 Q Take your time. 13:04
20	20 A Look on page 145 of the PDF file, and the 13:04
21	21 first line is part of a sentence. In the middle of 13:05
22	22 the sentence, it says: 13:05
23	23 "Control signals are passed parallel to a 13:05
24	24 bank of eight chips." 13:05
25	25 And that's just before Figure 4.4. 13:05
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1 AFTERNOON SESSION	1 Q Okay. But a person of ordinary skill in the 13:05
2 June 26, 2023 1:00 P.M.	2 art in, let's say, 2006 would have understood the 13:05
3 ---oOo---	3 terms "bank" and "rank" to be referring to different 13:05
4	4 things; right? 13:05
5 THE VIDEOGRAPHER: We're going back on the 13:02	5 MR. RUECKHEIM: Object to the form; beyond 13:05
6 record. The time is 1:02 p.m. 13:02	6 the scope. 13:05
7 And this is the start of Media Unit No. 5. 13:02	7 THE WITNESS: I believe that the difference 13:05
8 MR. TEZYAN: Welcome back, Dr. Stone. 13:02	8 between "bank" and "rank" would vary with the -- would 13:05
9 Q Did you have any communications with counsel 13:02	9 vary with the person of ordinary skill. I believe 13:06
10 on the break? 13:02	10 that Figure 4.5 that I call banks would be viewed as 13:06
11 A I did not. 13:02	11 ranks as well by a person of ordinary skill in the 13:06
12 Q Before the break, you had mentioned one of 13:02	12 art. 13:06
13 your books. I believe it's the micro interfacing -- 13:02	13 MR. TEZYAN: Q. And why is that, sir? 13:06
14 I'm sorry. I butchered the title of that book. But 13:02	14 A Well -- 13:06
15 I've uploaded it as Exhibit 8. 13:02	15 MR. RUECKHEIM: Same objections. 13:06
16 (Document remotely marked Exhibit 8 13:02	16 THE WITNESS: -- the bus that connects the 13:06
17 for identification.) 13:02	17 data -- I'm sorry. 13:06
18 MR. TEZYAN: Q. Can you please update your 13:02	18 The chip select that goes out to the eight 13:06
19 Exhibit Share? 13:02	19 chips, you use a different chip select for each of the 13:06
20 A Sure. I have downloaded it already. 13:02	20 eight -- this is -- I'm sorry. 16 columns. It's 13:06
21 Q Fantastic. 13:02	21 16 columns by eight rows. So we have 16 chip selects. 13:06
22 What is Exhibit 8? 13:02	22 And the person of ordinary skill would say, 13:07
23 A I'm sorry. Repeat your question, please. 13:02	23 "Well, I'm either going to select bank 0 or bank 15." 13:07
24 Q What is Exhibit 8? 13:02	24 And that person of ordinary skill could say, "Well, 13:07
25 A Exhibit 8 is "Microcomputer Interfacing." 13:02	25 these are ranks, rank 0 to rank 15." 13:07
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1 That's because there was no firm definition 13:07	1 the board, so it would not be produced locally. 13:09
2 of what a bank and a rank was in those days. 13:07	2 Q Understood. 13:10
3 MR. TEZYAN: Okay. 13:07	3 So when you say that the chip select might be 13:10
4 Q But at some point, the use of the word "rank" 13:07	4 produced locally, in other words, what you're saying 13:10
5 became standard to differentiate it from a "bank"; 13:07	5 is it might be produced on the memory module; right? 13:10
6 right? 13:07	6 A In this example, yes. 13:10
7 MR. RUECKHEIM: Same objections. 13:07	7 Q Okay. Is another example of that when the 13:10
8 THE WITNESS: I don't know if it became 13:07	8 memory controller transmits packetized information to 13:10
9 standard. I know that rank is used today, and I know 13:07	9 the memory module that's then also decoded on the 13:10
10 there was a time when rank and bank were both used. 13:07	10 memory module to produce chip select signals? 13:10
11 And at the time I wrote this, bank was. 13:07	11 MR. RUECKHEIM: Object to the form; beyond 13:10
12 But look at the structure. Okay. So the 13:07	12 the scope. 13:10
13 structure is telling. 13:08	13 THE WITNESS: Your hypothetical may have many 13:10
14 MR. TEZYAN: Q. Were you done with your 13:08	14 answers. I would have to -- to ask you more about all 13:10
15 answer? 13:08	15 of the parameters in that. So it's -- it's too 13:10
16 A I'm done with my answer. 13:08	16 complicated for me to answer directly. I -- I think 13:10
17 Is that what you're asking? 13:08	17 that's what my testimony is right now. 13:10
18 Q Yeah. 13:08	18 MR. TEZYAN: Okay. 13:10
19 Okay. So let me clarify something you said a 13:08	19 Q In this example, you have multiple memory 13:10
20 little bit earlier. You testified that chip selects 13:08	20 devices for each rank; is that correct? 13:10
21 might not be produced on a bus, and they might be 13:08	21 In other words, how many ranks are on this 13:11
22 produced locally in other ways. 13:08	22 memory device depicted here? 13:11
23 Do you recall that testimony? 13:08	23 A The chip select can select among 16 banks or 13:11
24 A I do. 13:08	24 ranks. So there's 16 banks or ranks. Each bank or 13:11
25 MR. RUECKHEIM: Object to the form. 13:08	25 rank comprises eight chips. That's my answer. 13:11
Page 74	Page 76
1 MR. TEZYAN: Okay. 13:08	1 Q Okay. So the answer to my question is yes, 13:11
2 Q What did you mean by that? 13:08	2 there are multiple devices for each of the ranks 13:12
3 A Well, in this example, the chip select is 13:08	3 depicted here; is that correct? 13:12
4 produced locally. It's -- 13:08	4 A There are multiple devices on each of the 13:12
5 Q What does -- sorry. 13:08	5 banks or ranks, yes. 13:12
6 A I'm sorry? 13:08	6 Q Okay. So a person of ordinary skill in the 13:12
7 Q I was going to ask: What do you mean by it 13:08	7 art would not refer to a single memory device as a 13:12
8 might be "produced locally"? 13:08	8 rank; fair? 13:12
9 A Do you see that 4-by-16 decoder? 13:09	9 MR. RUECKHEIM: Object to the form, and 13:12
10 Q Yes. 13:09	10 beyond the scope. 13:12
11 A 4 bits from -- I'm sorry -- 4 bits from the 13:09	11 THE WITNESS: The answer is no. I don't 13:12
12 address go to the decoder, and they're used in this 13:09	12 believe that's a fair answer. 13:12
13 case, in this example, to create chip selects. 4 bits 13:09	13 MR. RUECKHEIM: And Counsel, you're 13:12
14 give you 16 possibilities, and that's how we select 13:09	14 getting -- straying well outside his report. Do these 13:12
15 them. In that case, I would say this chip select is 13:09	15 questions relate at all to the claim construction 13:12
16 produced on the board. It's produced locally. 13:09	16 declaration that the deposition is supposed to be 13:12
17 If you want to say -- give an example of 13:09	17 directed to? 13:12
18 something where it's not produced locally, the chip 13:09	18 MR. TEZYAN: Q. Dr. Stone, can you pull up 13:12
19 select could be produced on the memory bus by a 13:09	19 the '918 patent? 13:12
20 controller. And the controller may be two, three -- 13:09	20 A Would you repeat your question. 13:12
21 I'm sorry -- two or four chip selects, for example. 13:09	21 Q I'm sorry. Could you please pull up the 13:12
22 And the controller can select a bank or a rank by 13:09	22 '918 patent. 13:12
23 enabling one of the four or one of the two chip 13:09	23 A Okay. I'm pulling up Exhibit 4. 13:12
24 selects. In that case, the controller would produce 13:09	24 I have it. 13:13
25 the chip select. And I would say it's not produced on 13:09	25 Q And could you go to Claim No. 12, please. I 13:13
Page 75	Page 77

<p>1 believe that's on page 47. 13:13</p> <p>2 A I have it. 13:13</p> <p>3 Q Okay. So Claim No. 12 is a dependent claim 13:13</p> <p>4 from Claim 5; right? 13:13</p> <p>5 A That's correct. 13:13</p> <p>6 Q And it recites: 13:13</p> <p>7 "The plurality of components further 13:13</p> <p>8 comprising: a non-volatile memory." 13:13</p> <p>9 Right? 13:13</p> <p>10 A That's correct. 13:13</p> <p>11 Q And a controller that's: 13:13</p> <p>12 "Configured to receive the trigger signal, 13:13</p> <p>13 wherein, in response to the trigger signal, the 13:13</p> <p>14 controller performs a write operation to the 13:14</p> <p>15 non-volatile memory." 13:14</p> <p>16 Right? 13:14</p> <p>17 A That's correct. 13:14</p> <p>18 Q So the controller needs to be connected to 13:14</p> <p>19 the non-volatile memory; fair? 13:14</p> <p>20 MR. RUECKHEIM: Object to the form. 13:14</p> <p>21 THE WITNESS: I'm not sure what you mean by 13:14</p> <p>22 "connected." The controller has to control the 13:14</p> <p>23 non-volatile memory. 13:14</p> <p>24 MR. TEZYAN: Right. 13:14</p> <p>25 Q But here specifically, it says: 13:14</p> <p style="text-align: right;">Page 78</p>	<p>1 Q Would your answer change depending on those 13:15</p> <p>2 definitions? 13:16</p> <p>3 MR. RUECKHEIM: Object to the form. 13:16</p> <p>4 THE WITNESS: If you had a situation in which 13:16</p> <p>5 the controller is connected to the non-volatile memory 13:16</p> <p>6 through intermediate devices, and you're using the 13:16</p> <p>7 connected through intermediate devices as if it 13:16</p> <p>8 meant -- as -- I'm sorry. 13:16</p> <p>9 If I'm answering, "No, because there's 13:16</p> <p>10 intermediate devices," and you would say, "No, it's 13:16</p> <p>11 really connected," then we are at odds. 13:16</p> <p>12 And conversely, if it's directly connected, I 13:16</p> <p>13 would -- I would say it's connected then one way or 13:16</p> <p>14 the other. 13:16</p> <p>15 But we -- we could come up with different 13:16</p> <p>16 answers, "yes" and "no," depending on how we interpret 13:16</p> <p>17 indirect connection. That's the issue. 13:16</p> <p>18 MR. TEZYAN: Okay. 13:16</p> <p>19 Q Is the controller not connected to the 13:16</p> <p>20 non-volatile memory if there is an intermediary in 13:16</p> <p>21 between? 13:16</p> <p>22 MR. RUECKHEIM: Object to the form. 13:16</p> <p>23 THE WITNESS: Again, you used the word 13:17</p> <p>24 "connected." 13:17</p> <p>25 MR. TEZYAN: Yeah, and I'll just repeat the 13:17</p> <p style="text-align: right;">Page 80</p>
<p>1 "The controller performs a write operation to 13:14</p> <p>2 the non-volatile memory." 13:14</p> <p>3 Right? 13:14</p> <p>4 A It -- the: 13:14</p> <p>5 "The controller performs a write operation to 13:14</p> <p>6 the non-volatile memory." 13:14</p> <p>7 That's correct. 13:14</p> <p>8 Q Okay. So would a person of ordinary skill in 13:14</p> <p>9 the art understand that the controller needs to be 13:14</p> <p>10 connected to the non-volatile memory? 13:14</p> <p>11 MR. RUECKHEIM: Object to the form. 13:14</p> <p>12 THE WITNESS: Yeah, the -- your use of the 13:14</p> <p>13 word "connected" can be interpreted many different 13:14</p> <p>14 ways. So I don't know how to answer the question 13:14</p> <p>15 unless you tell me specifically what you mean by 13:14</p> <p>16 "connected." 13:15</p> <p>17 MR. TEZYAN: Q. What does the word 13:15</p> <p>18 "connected to" mean to you? 13:15</p> <p>19 A Well, it could be attached directly to, or it 13:15</p> <p>20 may be that the controller goes -- sends an operation 13:15</p> <p>21 request to an intermediate device, and that sends it 13:15</p> <p>22 on to another intermediate device, and that goes to 13:15</p> <p>23 the non-volatile memory. 13:15</p> <p>24 So I'm not sure what question I'm answering 13:15</p> <p>25 if I say "yes" or "no." 13:15</p> <p style="text-align: right;">Page 79</p>	<p>1 question. 13:17</p> <p>2 Q Is the controller not connected to the 13:17</p> <p>3 non-volatile memory if there is an intermediary in 13:17</p> <p>4 between? 13:17</p> <p>5 MR. RUECKHEIM: Same objection. 13:17</p> <p>6 THE WITNESS: You're -- I -- I need to know 13:17</p> <p>7 what you mean when you say is connected or not 13:17</p> <p>8 connected. If there's intermediate devices between, 13:17</p> <p>9 that's -- that says something. Now, you tell me what 13:17</p> <p>10 you mean by "connected." 13:17</p> <p>11 MR. TEZYAN: Okay. 13:17</p> <p>12 Q I think we can agree that if connected means 13:17</p> <p>13 attached to, right, that the non-volatile memory -- 13:17</p> <p>14 I'm sorry. Let me back up. 13:17</p> <p>15 Okay. So you're saying "connected to" could 13:17</p> <p>16 mean either attached directly or attached to an 13:17</p> <p>17 intermediary; correct? 13:17</p> <p>18 A At least those two, yes. 13:17</p> <p>19 Q Okay. So my question is -- is really: In 13:17</p> <p>20 the case where you're saying the controller and 13:17</p> <p>21 non-volatile memory are indirectly connected, that's 13:18</p> <p>22 not a connection? 13:18</p> <p>23 MR. RUECKHEIM: Object to the form. 13:18</p> <p>24 THE WITNESS: No. 13:18</p> <p>25 The -- you're still using the word 13:18</p> <p style="text-align: right;">Page 81</p>

<p>1 "connection," and I don't know how you mean. And so I 13:18</p> <p>2 can't answer until you -- you need to define 13:18</p> <p>3 "connected," and then I can handle it. 13:18</p> <p>4 MR. TEZYAN: Okay. 13:18</p> <p>5 Q Well, you provided me two definitions of 13:18</p> <p>6 "connection." And I'm just asking you to apply the 13:18</p> <p>7 second one and answer whether, under those 13:18</p> <p>8 circumstances, you think that the non-volatile memory 13:18</p> <p>9 and the controller would need to be connected? 13:18</p> <p>10 A And -- 13:18</p> <p>11 MR. RUECKHEIM: Object to the form. 13:18</p> <p>12 THE WITNESS: -- the second definition was 13:18</p> <p>13 the controller -- "connection" can mean indirectly 13:18</p> <p>14 with intermediate devices; is that correct? 13:18</p> <p>15 MR. TEZYAN: Yes. 13:19</p> <p>16 THE WITNESS: If the controller is attached 13:19</p> <p>17 to the non-volatile memory through intermediate 13:19</p> <p>18 devices, using your second definition of connection 13:19</p> <p>19 that allows that connection to have intermediate 13:19</p> <p>20 devices, then the controller is connected to 13:19</p> <p>21 non-volatile memory with your definition. 13:19</p> <p>22 MR. TEZYAN: Okay. 13:19</p> <p>23 Q And if we define "connected to" to mean 13:19</p> <p>24 "attached to," that would also be a connection; right? 13:19</p> <p>25 MR. RUECKHEIM: Object to the form. 13:19</p> <p style="text-align: right;">Page 82</p>	<p>1 MR. RUECKHEIM: Object to the form. 13:20</p> <p>2 MR. TEZYAN: Q. Either through an 13:20</p> <p>3 intermediary or directly? 13:20</p> <p>4 A Got it. 13:20</p> <p>5 So the controller needs to be connected 13:20</p> <p>6 directly or indirectly to the non-volatile memory in 13:20</p> <p>7 order to perform the write operation in the 13:21</p> <p>8 non-volatile memory. That is my testimony. 13:21</p> <p>9 (Document remotely marked Exhibit 9 13:21</p> <p>10 for identification.) 13:21</p> <p>11 MR. TEZYAN: I've gone ahead and produced 13:21</p> <p>12 Exhibit 9. 13:21</p> <p>13 Q Could you please refresh your Exhibit Share 13:21</p> <p>14 and download Exhibit 9 when it comes up. 13:21</p> <p>15 A Okay. I'm downloading it now. 13:21</p> <p>16 Okay. I have it downloaded. Now I'll bring 13:22</p> <p>17 it up. 13:22</p> <p>18 I have it. 13:22</p> <p>19 Q What is Exhibit 9, Dr. Stone? 13:22</p> <p>20 A This is the '060 patent. 13:22</p> <p>21 Q Could you please go to Figure 1A. 13:22</p> <p>22 A Okay. 13:22</p> <p>23 Q And if you need to rotate your screen, that's 13:22</p> <p>24 fine. 13:22</p> <p>25 A Okay. I -- I just rotated it. Go ahead. 13:22</p> <p style="text-align: right;">Page 84</p>
<p>1 THE WITNESS: I want to ascertain that 13:19</p> <p>2 "attached to" means directly, without intervening -- 13:19</p> <p>3 intervening devices. 13:19</p> <p>4 The fact is if there are inter- -- 13:19</p> <p>5 intervening devices, you should know about that. And 13:19</p> <p>6 if there are not, you should also know about that. So 13:19</p> <p>7 the -- 13:20</p> <p>8 MR. TEZYAN: That's -- that's fair. 13:20</p> <p>9 Q So assume there's no intermediary devices. 13:20</p> <p>10 In that situation, is the controller and non-volatile 13:20</p> <p>11 memory connected? 13:20</p> <p>12 A Using the first -- 13:20</p> <p>13 MR. RUECKHEIM: Objection. 13:20</p> <p>14 THE WITNESS: -- definition -- is that the 13:20</p> <p>15 definition you want me to use? 13:20</p> <p>16 MR. TEZYAN: Yes. 13:20</p> <p>17 THE WITNESS: In that case, the controller is 13:20</p> <p>18 connected to the non-volatile memory, because your 13:20</p> <p>19 first definition of "connection" means that there are 13:20</p> <p>20 no intermediate devices. 13:20</p> <p>21 MR. TEZYAN: Okay. 13:20</p> <p>22 Q So under either definition of "connected to," 13:20</p> <p>23 is it fair that in order to perform a write operation 13:20</p> <p>24 to non-volatile memory, the controller has to be 13:20</p> <p>25 connected to non-volatile memory? 13:20</p> <p style="text-align: right;">Page 83</p>	<p>1 Q Okay. So the rectangles that are annotated 13:23</p> <p>2 110, those are the array dies; correct? 13:23</p> <p>3 A Yes, those are dies. 13:23</p> <p>4 Q And specifically, the array dies that the 13:23</p> <p>5 patent talks about; right? 13:23</p> <p>6 A They're -- they are the array dies. That's 13:23</p> <p>7 correct. 13:23</p> <p>8 Q Okay. And the vertical line that's labeled 13:23</p> <p>9 120, that's the die interconnect; right? 13:23</p> <p>10 A That's the die interconnect. That's correct. 13:23</p> <p>11 Q And 134 is a data driver; correct? 13:23</p> <p>12 A That's correct. 13:23</p> <p>13 Q So does what's depicted in Figure 1A 13:23</p> <p>14 correspond to a multi-drop configuration? 13:23</p> <p>15 A I can't tell. 13:24</p> <p>16 Q Are you familiar with the term 13:24</p> <p>17 "multi-drop" -- 13:24</p> <p>18 A I am. 13:24</p> <p>19 Q -- like if you're referring to a multi-drop 13:24</p> <p>20 TSV configuration? 13:24</p> <p>21 A Well, I -- there is not sufficient detail. 13:24</p> <p>22 But I will tell you what would make it multi-drop if I 13:24</p> <p>23 had the detail. 13:24</p> <p>24 Q Okay. 13:24</p> <p>25 A Okay. 144, those three lines attached from 13:24</p> <p style="text-align: right;">Page 85</p>

<p>1 the driver -- the driver level to three different 13:24</p> <p>2 dies, I can't tell what's on those dies. If those 13:24</p> <p>3 dies each had something to connect to, you could -- 13:24</p> <p>4 and let's say the first -- the shortest 144 connected 13:25</p> <p>5 to it sometimes, and the second 144 connected to it 13:25</p> <p>6 sometimes, and the third connected to it sometimes. 13:25</p> <p>7 You might consider that multi-drop if all three 144 13:25</p> <p>8 lines were connected. 13:25</p> <p>9 Q Fair enough. 13:25</p> <p>10 But my question was specific to the -- the 13:25</p> <p>11 data die interconnect. Right. 13:25</p> <p>12 If -- if you want to refresh your memory, in 13:25</p> <p>13 column 1, lines, I think, 39 through about 46, it 13:25</p> <p>14 states that the -- let's see -- the driver 140 is for 13:25</p> <p>15 command and address signals. And 144, those are chip 13:26</p> <p>16 select lines; right? 13:26</p> <p>17 A That's correct. 144 are chip selects. 13:26</p> <p>18 That's correct. 13:26</p> <p>19 Q Yeah. 13:26</p> <p>20 And 142 are command and address signals; 13:26</p> <p>21 right? 13:26</p> <p>22 A That's correct. 13:26</p> <p>23 Q Okay. So specifically for the data signals 13:26</p> <p>24 on the die interconnect that's for data connected to 13:26</p> <p>25 driver 134, is that in a multi-drop arrangement? 13:26</p> <p style="text-align: right;">Page 86</p>	<p>1 My declaration is Exhibit 1. 13:28</p> <p>2 Q Correct. 13:28</p> <p>3 A I'm pulling up Exhibit 1. 13:28</p> <p>4 And you want me to go to paragraph -- 13:28</p> <p>5 Q Paragraph 29. 13:28</p> <p>6 A -- 29? 13:28</p> <p>7 Q Uh-huh. 13:28</p> <p>8 A I'm there. 13:28</p> <p>9 Q And you see this annotated version of 13:28</p> <p>10 Figure 1B here; right? 13:28</p> <p>11 A I see, yes. 13:28</p> <p>12 Q And there is a green line that indicates the 13:29</p> <p>13 data die interconnect 182; right? 13:29</p> <p>14 A I do. 13:29</p> <p>15 Q Okay. That die interconnect is in electrical 13:29</p> <p>16 communication with each of these array dies; right? 13:29</p> <p>17 MR. RUECKHEIM: Object to the form. 13:29</p> <p>18 THE WITNESS: I'm looking where it says that 13:29</p> <p>19 in my report. I -- I see. It -- it says: 13:29</p> <p>20 "That ... [includes] a driver 184 that drives 13:29</p> <p>21 data signals to each of the array dies 160." 13:29</p> <p>22 Okay. I see that. 13:29</p> <p>23 MR. TEZYAN: Q. And just so I'm clear, I 13:29</p> <p>24 asked: That die interconnect is in electrical 13:29</p> <p>25 communication with each of those array dies; right? 13:29</p> <p style="text-align: right;">Page 88</p>
<p>1 A I can't tell from the figure. 13:26</p> <p>2 Q Why not? 13:26</p> <p>3 A I don't know what is driving on the dies. 13:26</p> <p>4 Q Oh, what do you mean by that? 13:26</p> <p>5 A Well, let me get the figure up again. Just a 13:26</p> <p>6 second. 13:26</p> <p>7 So 134 comes out of a driver and goes up to 13:27</p> <p>8 three different levels of the die; is that correct? 13:27</p> <p>9 Q Yes. 13:27</p> <p>10 A If nothing was connected at the first and 13:27</p> <p>11 second level, but only the third level, it would not 13:27</p> <p>12 be multi-drop. And I can't tell. 13:27</p> <p>13 Q What do you mean by nothing is connected? If 13:27</p> <p>14 there is no driver or receiver pair on that die? 13:27</p> <p>15 A This VIA can be connected to a die or not 13:27</p> <p>16 connected to a die. I mean, if the VIA is not 13:27</p> <p>17 connected to the die, and there's nothing for it to 13:27</p> <p>18 connect to, then if the first and second ones are not 13:27</p> <p>19 connected to the die at all, and the third one is, 13:27</p> <p>20 that's not multi-drop. 13:27</p> <p>21 Q Okay. Let's take a look at paragraph 29 of 13:28</p> <p>22 your declaration, and that's on PDF page 12. 13:28</p> <p>23 A Just a moment. I'm going to pull it up from 13:28</p> <p>24 what I downloaded just to make sure I've got exactly 13:28</p> <p>25 the same thing that you have. 13:28</p> <p style="text-align: right;">Page 87</p>	<p>1 A And I -- you're -- you're using "electrical 13:30</p> <p>2 communication" as the patent teaches? 13:30</p> <p>3 Q Yes. 13:30</p> <p>4 A And they're attached -- yes. I would say 13:30</p> <p>5 yes, it's in electrical communication with each of 13:30</p> <p>6 those array dies. 13:30</p> <p>7 Q Okay. So going back to my earlier questions 13:30</p> <p>8 then, does this correspond to a multi-drop 13:30</p> <p>9 configuration? 13:30</p> <p>10 A I -- I don't have sufficient information. 13:30</p> <p>11 MR. TEZYAN: Let me pull up an example. One 13:30</p> <p>12 moment. 13:30</p> <p>13 (Document remotely marked Exhibit 10 13:31</p> <p>14 for identification.) 13:31</p> <p>15 MR. TEZYAN: Q. Please refresh your Exhibit 13:31</p> <p>16 Share. 13:31</p> <p>17 A Okay. 13:31</p> <p>18 Q Let me know when you have the latest exhibit. 13:31</p> <p>19 A I'm just starting to load Exhibit 10, and 13:32</p> <p>20 I'll be downloading it. 13:32</p> <p>21 I have downloaded Exhibit 10. 13:32</p> <p>22 Q Okay. Exhibit 10 is an ISSCC paper entitled: 13:32</p> <p>23 "A 1.2V 64Gb 341GB/s HBM2 Stacked DRAM with 13:32</p> <p>24 Spiral Point-to-Point TSV Structure and Improved Bank 13:32</p> <p>25 Group Data Control." 13:32</p> <p style="text-align: right;">Page 89</p>

<p>1 Right? 13:32</p> <p>2 A Yes, that's the title. 13:32</p> <p>3 Q Okay. Feel free to look it over if you'd 13:32</p> <p>4 like to. But my questions are about Figure 12.3.1 13:32</p> <p>5 that appears on page 2. So let me know when you're 13:32</p> <p>6 there. 13:32</p> <p>7 A Okay. I will have difficulty making 13:33</p> <p>8 testimony on this because I've just seen it for the 13:33</p> <p>9 first time. I'll do my best. But I may just say I 13:33</p> <p>10 need time to read it, and read it carefully. 13:33</p> <p>11 Let me take a look. 13:33</p> <p>12 Q That's fine. Take as much time as you need. 13:33</p> <p>13 A Well, I'm ready to attempt an answer, but 13:34</p> <p>14 I -- I believe that I really need a lot of time to 13:34</p> <p>15 read this. Go ahead and ask your question. 13:34</p> <p>16 Q That's fair. 13:34</p> <p>17 My question is just very discrete here. So 13:34</p> <p>18 on page 2, Figure 12.3.1, you see a figure that 13:34</p> <p>19 underneath says "Conventional Multi-Drop"; right? 13:34</p> <p>20 A Yes. 13:34</p> <p>21 Q So when I'm using the word "multi-drop" in my 13:34</p> <p>22 previous questions, I'm referring to this sort of an 13:35</p> <p>23 arrangement. 13:35</p> <p>24 Is that making sense, where the TSVs -- 13:35</p> <p>25 A I understand. I understand. 13:35</p> <p style="text-align: right;">Page 90</p>	<p>1 A There's an answer in my book. I have a 13:36</p> <p>2 diagram that explains why. 13:36</p> <p>3 Q Could you summarize your answer without -- 13:36</p> <p>4 A No. I want to see the diagram. 13:36</p> <p>5 Q I'd prefer if you'd just give me an answer 13:36</p> <p>6 first, sir. 13:36</p> <p>7 A I can't do that. I need to show you the 13:36</p> <p>8 diagram. 13:36</p> <p>9 Q You can't provide me an answer without the 13:36</p> <p>10 diagram? 13:36</p> <p>11 A I can. 13:36</p> <p>12 MR. RUECKHEIM: Objection to form. 13:36</p> <p>13 THE WITNESS: It will not be -- it will not 13:36</p> <p>14 be informative. I need the diagram. 13:36</p> <p>15 MR. TEZYAN: Okay. 13:37</p> <p>16 Q Where is -- which exhibit is this? 13:37</p> <p>17 A My book is now the Exhibit 8. And -- 13:37</p> <p>18 Q Okay. 13:37</p> <p>19 A -- in my book, the book page number is 54. 13:37</p> <p>20 I'll get you the PDF page number in a minute. The 13:37</p> <p>21 material of interest begins on PDF page 54. It's 13:37</p> <p>22 called: 13:37</p> <p>23 "Transmission-Line Techniques." 13:37</p> <p>24 Q I'm sorry. That's internal page number? 13:37</p> <p>25 A On the PDF file, it's -- oh, I'm sorry. I -- 13:37</p> <p style="text-align: right;">Page 92</p>
<p>1 Q -- where the TSVs that are connected to 13:35</p> <p>2 channel 0 are connected to the drivers on each of the 13:35</p> <p>3 die? 13:35</p> <p>4 A Yes, I understand that. 13:35</p> <p>5 Q Okay. So going back to Figure 1A of the 13:35</p> <p>6 '060 patent, is it still the case that you can't tell 13:35</p> <p>7 from the figure alone whether this depicts a 13:35</p> <p>8 multi-drop configuration? 13:35</p> <p>9 A That's correct. 13:35</p> <p>10 Q Okay. And why is that? 13:35</p> <p>11 A Figure -- that figure doesn't show whether 13:35</p> <p>12 the VIA on any die is connected to a data port. You 13:35</p> <p>13 can be connected to the die but not to a data port, or 13:35</p> <p>14 you could be connected to a die and you're connected 13:35</p> <p>15 to a data port. So I can't tell. 13:35</p> <p>16 Q Okay. But if you're not connected to a data 13:36</p> <p>17 port, there is no electrical communication to the die; 13:36</p> <p>18 right? 13:36</p> <p>19 A That's false. That's false. 13:36</p> <p>20 MR. RUECKHEIM: Objection. 13:36</p> <p>21 MR. TEZYAN: Okay. 13:36</p> <p>22 Q Why is that? 13:36</p> <p>23 A I would like you to open my book, please. 13:36</p> <p>24 Q I'd -- I'd prefer if you just answer my 13:36</p> <p>25 question. 13:36</p> <p style="text-align: right;">Page 91</p>	<p>1 it's 54 in my reader. It may be 69 in your reader. 13:38</p> <p>2 Q Okay. I'm there. 13:38</p> <p>3 A Okay. It says: 13:38</p> <p>4 "Transmission-Line Techniques." 13:38</p> <p>5 This tells you how waves flow on 13:38</p> <p>6 interconnections. 13:38</p> <p>7 I'm going to now go down to a part that shows 13:38</p> <p>8 what happens when you connect it to a stub on a die 13:38</p> <p>9 interconnect. 13:38</p> <p>10 Whoops. Where is it? 13:38</p> <p>11 One picture -- oh, let's start on PDF 13:38</p> <p>12 page 78. 13:38</p> <p>13 Do you see this? 13:38</p> <p>14 Q Figure 2.19? 13:38</p> <p>15 A 2.19. 13:39</p> <p>16 Q Okay. 13:39</p> <p>17 A You see all that noise? That noise is 13:39</p> <p>18 present because of reflections on the transmission 13:39</p> <p>19 line. Okay. 13:39</p> <p>20 If you disconnect one of those drivers -- one 13:39</p> <p>21 of those receivers, you'll get a different kind of 13:39</p> <p>22 noise, but you'll see the noise. That's because the 13:39</p> <p>23 wave is an electrical communication with a stub, even 13:39</p> <p>24 if there is no port array on it. 13:39</p> <p>25 Now, let me go down a little further to show 13:39</p> <p style="text-align: right;">Page 93</p>



<p>1 you what's happening. Look at Figure 2.20, page 79. 13:39</p> <p>2 Okay. On this page, a wave is sent from the left 13:39</p> <p>3 where there -- you see the Z0, and it goes out to 13:39</p> <p>4 where there's a junction. At the junction, it's 13:39</p> <p>5 reflected back, and part of the wave goes forward 13:39</p> <p>6 straight; part of it goes to the left. That's what 13:40</p> <p>7 you're dealing with with physics. 13:40</p> <p>8 And that happens when you're connected to the 13:40</p> <p>9 die, regardless of what happens on the die, whether 13:40</p> <p>10 there is a port array connected to it or not. 13:40</p> <p>11 So what happens is that the wave propagates 13:40</p> <p>12 on the die along the stub or to the port array, and it 13:40</p> <p>13 bounces back again. So those waves are going back and 13:40</p> <p>14 forth and back and forth, and that's what causes the 13:40</p> <p>15 noise that you saw in the earlier figure. 13:40</p> <p>16 Let me go back to 2.19. Do you see that 13:40</p> <p>17 noise there? Each bump or change is a result of a 13:40</p> <p>18 reflection, and the reflections come from the port 13:40</p> <p>19 arrays, the data arrays on the ports. They also come 13:40</p> <p>20 from the stubs if they don't have a data port 13:40</p> <p>21 connected, and they come from the points where there's 13:40</p> <p>22 a branch. 13:41</p> <p>23 So changing things by removing or adding 13:41</p> <p>24 devices only changes the noise, unless you don't have 13:41</p> <p>25 a multi -- unless there are no stubs or no drivers. 13:41</p> <p style="text-align: right;">Page 94</p>	<p>1 the die interconnects in" -- "communication with the 13:43</p> <p>2 respective drivers." 13:44</p> <p>3 Okay. Now, let's see. There may be 13:44</p> <p>4 additional I would like to look at. Now, continuing 13:44</p> <p>5 on from that point, it says: 13:44</p> <p>6 "In some embodiments, forming the electrical 13:44</p> <p>7 connections can comprise forming electrical 13:44</p> <p>8 connections between the die interconnects and a data 13:44</p> <p>9 conduit." 13:44</p> <p>10 Okay. 13:44</p> <p>11 Q I'm sorry to interrupt, but can I ask a 13:44</p> <p>12 clarifying question? 13:44</p> <p>13 A And see, that -- that -- well, actually, 13:44</p> <p>14 that's not so relevant. It's the previous sentence 13:44</p> <p>15 that I read: 13:44</p> <p>16 "Forming the electrical connections places 13:44</p> <p>17 the die interconnects in electrical communication with 13:44</p> <p>18 the respective drivers." 13:44</p> <p>19 So what we've done is we -- if you connect a 13:44</p> <p>20 die interconnect to a -- one of the levels in the 13:45</p> <p>21 figure, you now are connecting to some conductor. 13:45</p> <p>22 That conductor will carry a wave when you -- when you 13:45</p> <p>23 drive it. It has capacitance. It has a load. 13:45</p> <p>24 And whether or not that conductor is -- is 13:45</p> <p>25 attached to a data port, you will see the wave go down 13:45</p> <p style="text-align: right;">Page 96</p>
<p>1 Then you -- then you can get a predictable wave. And 13:41</p> <p>2 that has -- that even has reflections, but it looks 13:41</p> <p>3 different. 13:41</p> <p>4 So that's my testimony. 13:41</p> <p>5 Q Okay. Let me see if I understand something. 13:41</p> <p>6 Is it your testimony that the connection 13:41</p> <p>7 between a TSV and a stub is electrical communication? 13:41</p> <p>8 A Yeah. This demonstrates it, because the wave 13:41</p> <p>9 travels on that. 13:41</p> <p>10 Q Okay. What does the word "electrical 13:41</p> <p>11 communication" mean to you? 13:41</p> <p>12 A Electrical connection. That's -- I got that 13:41</p> <p>13 from the patent. I can show you where he says that. 13:41</p> <p>14 Q Okay. Show me. 13:41</p> <p>15 A Okay. The patent -- the -- is what exhibit? 13:41</p> <p>16 Q Exhibit 9, sir. 13:42</p> <p>17 A Okay. I'll open the Exhibit 9. 13:42</p> <p>18 So I have the '060 patent up. I'll -- I will 13:42</p> <p>19 find that reference that says that it connects -- 13:42</p> <p>20 makes the association between electrical communication 13:43</p> <p>21 and electrical connection. 13:43</p> <p>22 I would like you to look at column 17. 13:43</p> <p>23 Q Okay. I'm there. 13:43</p> <p>24 A I'm looking at line 65. Line 65 reads: 13:43</p> <p>25 "Forming the electrical connections places 13:43</p> <p style="text-align: right;">Page 95</p>	<p>1 that conductor. At the end, it will bounce -- bounce 13:45</p> <p>2 back, and you'll see that as noise. Moreover, the 13:45</p> <p>3 capacitance on the conductor will load the driver. 13:45</p> <p>4 So in every way, forming the electrical 13:45</p> <p>5 connection and placing this piece of a -- of a metal 13:45</p> <p>6 on the -- on an array, it will form to an electrical 13:45</p> <p>7 communication. That's what you'll get. Electrical 13:45</p> <p>8 connection is electrical communication in this sense. 13:45</p> <p>9 Q Okay. But can I ask a clarifying question? 13:46</p> <p>10 So on line 65, column 17, it says: 13:46</p> <p>11 "Forming the electrical connection places the 13:46</p> <p>12 die interconnects in electrical communication with the 13:46</p> <p>13 respective drivers." 13:46</p> <p>14 Right? 13:46</p> <p>15 That's talking about the drivers on the 13:46</p> <p>16 control die; right? 13:46</p> <p>17 A That's correct. 13:46</p> <p>18 Q Okay. So it's not talking about electrical 13:46</p> <p>19 communication with the array dies; right? 13:46</p> <p>20 A No. I disagree. 13:46</p> <p>21 Q Why? 13:46</p> <p>22 A You -- you will understand that the VIA is 13:46</p> <p>23 now connected to the -- to the array die, because 13:46</p> <p>24 there may be metal there. There may be a metal -- a 13:46</p> <p>25 metal pathway. 13:46</p> <p style="text-align: right;">Page 97</p>



1 Q I understand. 13:46	1 MR. RUECKHEIM: You didn't let him give but 13:51
2 But you're saying that this specific 13:46	2 three words. 13:51
3 disclosure that equates electrical connection with 13:46	3 THE WITNESS: Okay. 13:51
4 electrical communication discusses array dies. 13:46	4 MR. TEZYAN: Dr. Stone, if I may just 13:51
5 And I'm pointing out to you that it 13:46	5 answer -- ask my question one more time. 13:51
6 specifically says drivers, and these are drivers in 13:46	6 Q So the paragraph starting on line 60 of 13:51
7 the control die; right? 13:47	7 column 17, okay, where in that paragraph that you 13:52
8 A Yeah, but that's fine. The driver is in 13:47	8 claim provides support for your opinion that 13:52
9 communication with whatever the -- the VIA is 13:47	9 electrical connection and electrical communication are 13:52
10 connected to on that die. 13:47	10 the same does it talk about the array dies? 13:52
11 Q Does the passage mention electrical 13:47	11 A It refers to the process 500. If we look 13:52
12 communication with array dies? 13:47	12 back at the process 500, we will understand that the 13:52
13 MR. RUECKHEIM: Object to the form. 13:47	13 process 500 allows you to make a connection between 13:52
14 THE WITNESS: Does the -- it just -- it just 13:47	14 the die interconnect and the array die. 13:52
15 did. That's what it says. 13:47	15 Q Were you done with your answer? 13:52
16 MR. TEZYAN: Q. Where does it say "array 13:47	16 A That's -- that's -- I would like now to look 13:52
17 die" in this paragraph, sir? 13:47	17 at the description of process 500. May -- I'm going 13:52
18 A Just a moment. 13:47	18 to do that. 13:52
19 Okay. There is a reference to this in 13:48	19 Q Okay. 13:52
20 column 8 at line 57. 13:48	20 A Now, on column 17, line 24, the first 13:53
21 Q And I don't mean to cut you off, sir, but the 13:48	21 sentence says: 13:53
22 question was about paragraph -- the paragraph starting 13:48	22 "The process 500 further comprises forming 13:53
23 on line 60 of column 17. 13:48	23 electrical connections between the first die 13:53
24 And the question was: Where in that 13:48	24 interconnect and the first subset of array dies in an 13:53
25 paragraph that you claim provides support for your 13:48	25 operational block 504." 13:53
Page 98	Page 100
1 opinion that the patentee equated electrical 13:48	1 So there is where the connection is made. 13:53
2 connection with electrical communication does it talk 13:48	2 And if you -- if you go on, it tells you that 13:53
3 about electrical communication with the array dies 13:48	3 at line 29: 13:53
4 explicitly? 13:48	4 "Forming the electrical connections places 13:53
5 A All right. 13:49	5 the die interconnects in electrical communication with 13:53
6 I have to add to my opinion the description 13:49	6 the respective subsets of array dies." 13:53
7 that further clarifies what that sentence means. And 13:51	7 Q Okay. Can we go back to Figure 1A? 13:53
8 if you don't mind, I would like to now refer to -- 13:51	8 A Okay. In this patent? 13:54
9 MR. TEZYAN: That -- okay. So I'm going to 13:51	9 Q Yes, sir. 13:54
10 move to strike as nonresponsive. 13:51	10 So in Figure 1A, we have these multiple array 13:54
11 Q It's specifically the paragraph -- 13:51	11 dies 110; right? 13:54
12 A Here is -- 13:51	12 A I see that. 13:54
13 Q -- in column 17 -- 13:51	13 Q And they're connected via die 13:54
14 A I will amend my response. 13:51	14 interconnect 120 to driver 134; right? 13:54
15 Q I'm sorry. What? 13:51	15 A That's correct. 13:54
16 A Let me amend my response so that it's not 13:51	16 Q So can the multiple array dies output data in 13:54
17 stricken from the record so I can get it right. 13:51	17 parallel to driver 134? 13:54
18 Q Okay. But can you answer the question first, 13:51	18 MR. RUECKHEIM: Object to the form. 13:54
19 sir? 13:51	19 THE WITNESS: I -- I -- I need you to repeat 13:54
20 The question was specifically -- 13:51	20 your question. I'm not sure I understand it. 13:54
21 MR. RUECKHEIM: You cut off -- you cut off 13:51	21 MR. TEZYAN: Sure. No problem. 13:54
22 his answer. Can you allow the witness to answer the 13:51	22 Q So can the multiple array dies output data in 13:54
23 question? 13:51	23 parallel to the driver? 13:54
24 MR. TEZYAN: He's answering the question he 13:51	24 A It doesn't say. 13:55
25 wants to answer, and I want him to answer my question. 13:51	25 Q Right. 13:55
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<p>1 But would a person of ordinary skill in the 13:55  2 art, looking at this, understand that the array dies 13:55  3 could do that? 13:55  4 A It's not specified yes or no. I -- so I'm 13:55  5 not sure. There may be some teaching that says yes, 13:55  6 some teaching that says no. In isolation, I cannot 13:55  7 tell by looking at Figure 1A whether they can output 13:55  8 in parallel. 13:55  9 Q Let me give a more concrete example, maybe. 13:55  10 So suppose the -- you have a read operation; right? 13:55  11 Can multiple array dies respond to that read operation 13:55  12 at the same time? 13:55  13 MR. RUECKHEIM: Object to the form. 13:55  14 THE WITNESS: In this diagram? 13:56  15 MR. TEZYAN: Q. Assuming you had the memory 13:56  16 package that's depicted in this diagram, yeah. 13:56  17 A I can't tell from this diagram alone, no. I 13:56  18 don't know. I'd need more information to answer that 13:56  19 question. 13:56  20 Q Well, this diagram depicts that all of the 13:56  21 array dies share one die interconnect for the data 13:56  22 driver 134; right? 13:56  23 A In this diagram, there's only one data 13:56  24 driver. Yes. 13:56  25 Q Okay. And so to put my question another way, 13:56  Page 102</p>	<p>1 interconnect. Not conflicting means that you know 13:58  2 they're all going to be 1s, or they're all going to be 13:58  3 0s, or you know that some are disconnected. As long 13:58  4 as there are no conflicts at the die interconnect, you 13:58  5 may succeed, but you may need to have intervening 13:58  6 logic. 13:58  7 On the other hand, you will probably run into 13:58  8 a problem, not necessarily a failure, if one driver on 13:58  9 one array layer is driving a 0, and another driver on 13:59  10 a different array layer is driving a 1. Now, that 13:59  11 does happen. That does happen, okay, and that happens 13:59  12 when you're finishing an operation on one, and you're 13:59  13 starting an operation on the other. Because of 13:59  14 timing, there could be a moment or two, a brief 13:59  15 period, when both drivers are active in the opposite 13:59  16 direction. And you can design those layers to protect 13:59  17 against damage. 13:59  18 So the answer is, if there are two -- just 13:59  19 two layers and they are operated in parallel, the 13:59  20 answer is that could happen, yes. 13:59  21 Q Okay. So if I understand your answer 13:59  22 correctly, the reason why it might be a problem is the 13:59  23 risk of data collisions; right? 14:00  24 A That's correct. 14:00  25 MR. TEZYAN: Okay. I think we can take a 14:00  Page 104</p>
<p>1 could all of the array dies output data at the same 13:56  2 time to that driver 134 along the die interconnect? 13:56  3 MR. RUECKHEIM: Object to the form. 13:57  4 THE WITNESS: Are you asking the question 13:57  5 that -- here's the hypothesis as I understand it. 13:57  6 Each of the layers 110 has a memory that 13:57  7 somehow or other is triggered to output data. And 13:57  8 somehow or other, all the memories on those array 13:57  9 levels are triggered at the same time. So all of the 13:57  10 cells attempt to output data at the same time. Not 13:57  11 only that, they all output onto die interconnect 110. 13:57  12 You're asking, is this possible? That 13:57  13 probably is not possible. It just -- it would be 13:57  14 unusual. I can't say it can't happen. But I think 13:57  15 that's what you're talking about. 13:57  16 MR. TEZYAN: Yeah, that sounds about right. 13:57  17 Q And I guess my question is: Why would that 13:57  18 not be possible? 13:58  19 A Well, I can give you an example where it is 13:58  20 possible, and then I can give you an example where 13:58  21 it's not possible. 13:58  22 Q Okay. 13:58  23 A The example where it is possible is if you 13:58  24 output all the things at the same time and do 13:58  25 something so that they don't conflict at the die 13:58  Page 103</p>	<p>1 ten-minute break now if that's fine with you guys. 14:00  2 THE WITNESS: Okay. Let's do that. 14:00  3 THE VIDEOGRAPHER: We're going to go off the 14:00  4 record. The time is 2:00 p.m. 14:00  5 And this is the end of Media Unit No. 5. 14:00  6 (Recess taken.) 14:00  7 THE VIDEOGRAPHER: We're going back on the 14:14  8 record. The time is 2:15 p.m. 14:15  9 And this is the start of Media Unit No. 6. 14:15  10 MR. TEZYAN: Q. So you testified that there 14:15  11 are certain scenarios where it would be okay for all 14:15  12 three of the dies that are depicted in Figure 1A to 14:15  13 drive along die interconnect 120. 14:15  14 Do you recall that testimony? 14:15  15 A I said there might be. I -- yes, I do recall 14:15  16 that. 14:15  17 Q Okay. And would your answer change if two of 14:15  18 the three dies were outputting data at the same time? 14:15  19 A I -- I'm sorry. I don't have all of the 14:15  20 hypotheses in mind. So can you give me the full 14:15  21 question with all the hypotheses? 14:15  22 Q Sure. 14:15  23 Let's go back to Figure 1A of the 14:15  24 '060 patent. 14:16  25 A Okay. 14:16  Page 105</p>

1 Q And you see that there are three array 14:16	1 person of ordinary skill in the art drive only one of 14:18
2 dies 110 here? 14:16	2 the array die to avoid conflict with the other two 14:18
3 A Yes, I see that. 14:16	3 array die, for instance? 14:18
4 Q That share a common data die 14:16	4 A Your question -- 14:19
5 interconnect 120? 14:16	5 MR. RUECKHEIM: Objection to form. 14:19
6 A I see that. 14:16	6 THE WITNESS: -- started -- I'm sorry. 14:19
7 Q Okay. And the question is: If we have a 14:16	7 Your question started "in that circumstance." 14:19
8 scenario where two of the three dies are outputting 14:16	8 I need to know what you're talking about. That -- 14:19
9 data at the same time, does that cause potential for 14:16	9 that's a little vague right now. 14:19
10 bus conflict? 14:16	10 MR. TEZYAN: Okay. 14:19
11 MR. RUECKHEIM: Object to the form. 14:16	11 Q Going back to Figure 1A, we see that there 14:19
12 THE WITNESS: I believe a bus conflict is 14:16	12 are three array dies in this stack; right? 14:19
13 when they're outputting data in opposite -- opposite 14:16	13 A Yes. 14:19
14 values. And I believe that if they both drive the bus 14:16	14 Q And let's say you only wanted to derive from 14:19
15 at different values at the same time, there -- I would 14:16	15 the top array die a signal. 14:19
16 call that a bus conflict. 14:16	16 A Okay. 14:19
17 However, in certain designs, it is not 14:16	17 Q And one way to do that to avoid interference 14:19
18 unusual to have such conflicts occur for very short 14:17	18 and data collision would be to disable dies -- the 14:19
19 periods of time as you transfer control from one array 14:17	19 middle die and the bottom die; right? 14:19
20 die to another between reads or writes or whatever. 14:17	20 A Well, you would prevent them from driving. 14:19
21 And the potential damage of conflicts is ameliorated 14:17	21 And you said disable. Whatever you did to prevent 14:19
22 or eliminated by design. 14:17	22 them from driving is what I would say you would do. 14:19
23 So that's -- that's my answer. 14:17	23 Q Okay. And to prevent them from driving, you 14:19
24 MR. TEZYAN: Right. 14:17	24 could disable the data ports on the array dies; right? 14:20
25 Q But I think baked in your answer is -- is -- 14:17	25 A Yes, you could. 14:20
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1 or let me put it this way -- sorry. Strike that. 14:17	1 Q Okay. And for those two array dies that have 14:20
2 What I'm asking is: Can array die 110 -- 14:17	2 their data ports disabled, are those still in 14:20
3 let's call the first one -- or I'm sorry. Strike 14:17	3 electrical communication with the die interconnect? 14:20
4 that. 14:17	4 MR. RUECKHEIM: Object to the form. 14:20
5 Can two of the array dies output data at the 14:17	5 THE WITNESS: The data port -- yes. The data 14:20
6 same time? 14:17	6 port is in electrical communication with the driver in 14:20
7 That's the question. 14:17	7 this sense. It has a termination. 14:20
8 A Well, I just gave you an answer where they're 14:17	8 And the wave from the -- let's say the top 14:20
9 both outputting data at the same time. I -- I don't 14:17	9 die goes down the die interconnect. It reaches the 14:20
10 know why that's not responsive. 14:17	10 second level, goes on the second level, goes toward 14:20
11 Q In -- in part, I think your response said 14:18	11 the data port, hits it, and bounces around, back to 14:20
12 it's not unusual to have such conflicts occur for 14:18	12 the 110, up and down. And likewise, it continues down 14:20
13 short periods of time as you transfer control away 14:18	13 to the first level, goes out to the data port, bounces 14:21
14 from one die to another. 14:18	14 around, and comes down. 14:21
15 So do you mean, by that, that there is some 14:18	15 Now, at the data port, the data port isn't 14:21
16 sort of delay time there? 14:18	16 driving that line. But because the data port is 14:21
17 A No. They could be both driving concurrently, 14:18	17 connected to the -- to the trace on that array die, 14:21
18 but not for very long. And you design the chip to 14:18	18 the wave will reach the driver and bounce back, and 14:21
19 allow that -- I mean, the drivers and whatever, you -- 14:18	19 that driver has to be terminated in some way. Maybe 14:21
20 you design them to allow this to occur. 14:18	20 it's infinite. Maybe it's got a resistor. But the 14:21
21 Q Okay. But in general, you want to avoid 14:18	21 wave will go back and will go from the die 14:21
22 having them drive concurrently; right? 14:18	22 interconnect and go to the driver that's been disabled 14:21
23 A I think a person of ordinary skill in the art 14:18	23 and bounce. 14:21
24 would try to avoid the driver collision. 14:18	24 So if you ask, is the driver in the 14:21
25 Q Okay. So in that circumstance, would a 14:18	25 electrical communication? Absolutely, because the 14:21
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1 wave is bouncing off the driver. 14:21	1 for that array die is disabled? 14:24
2 MR. TEZYAN: Okay. 14:21	2 A Yes. 14:24
3 Q And does that mean that the array dies, if 14:21	3 MR. RUECKHEIM: Objection to form. 14:24
4 their data ports are disabled, are still in electrical 14:22	4 MR. TEZYAN: Q. And why is that? 14:24
5 communication with the die interconnect? 14:22	5 A Well, there -- there are two aspects. 14:25
6 MR. RUECKHEIM: Object to the form. 14:22	6 First of all, as taught by the patent, load 14:25
7 THE WITNESS: I think your question -- I'm 14:22	7 is capacitive. Okay. The line that goes from the 14:25
8 not sure what the question is. 14:22	8 interconnect -- die interconnect 110 to the driver has 14:25
9 MR. TEZYAN: Sure. 14:22	9 capacitance. You have to charge or discharge a 14:25
10 Q So your explanation was essentially that the 14:22	10 capacitance, regardless if the driver is active. 14:25
11 data port, despite being disabled, is in electrical 14:22	11 In other words, let the top layer have a 14:25
12 communication with the die interconnect; is that fair? 14:22	12 driver that sends a wave down the die interconnect. 14:25
13 MR. RUECKHEIM: Object to the form. 14:22	13 Let the second layer be on a die interconnect in which 14:25
14 THE WITNESS: I think that's -- that would be 14:22	14 the driver is disabled. 14:25
15 fair. Go ahead. 14:22	15 That second layer still has capacitance 14:25
16 MR. TEZYAN: Okay. 14:22	16 between the die interconnect and the driver on that 14:25
17 Q And then my follow-up question to that is: 14:22	17 array die. And therefore, you have to charge or 14:25
18 Does that mean that the array dies with the data ports 14:22	18 discharge it. And therefore, it's in electrical 14:26
19 that are disabled are still in electrical 14:22	19 communication. 14:26
20 communication with the die interconnect? 14:22	20 But even more, even more, the driver that's 14:26
21 MR. RUECKHEIM: Object to the form. 14:22	21 drive -- that's about to drive the die 14:26
22 THE WITNESS: There's a figure in this patent 14:22	22 interconnect 110, let's say on the second or first or 14:26
23 that describes that. Let me -- let me show you the 14:22	23 the third layer -- layer, that driver is terminated. 14:26
24 figure. 14:22	24 It has a resistor. Sometimes it's called on-die 14:26
25 Whoops. 14:23	25 termination. That has a resistor. That could be 14:26
Page 110	Page 112
1 What I was looking for is a figure in a 14:23	1 connected, and that connection could be -- receive the 14:26
2 different patent. The -- there is on-die termination. 14:23	2 wave that's coming from the die interconnect when the 14:26
3 And the on-die termination is an electrical 14:23	3 wave is in electrical communication, and that as a 14:26
4 communication and an electrical connection with the 14:23	4 result, that on-die termination changes the reflection 14:26
5 die interconnect even when it's terminating a data 14:23	5 that goes back. 14:26
6 port that has been disabled. Okay. 14:23	6 If you terminate on die one way, you might 14:26
7 So if -- if your question is, am I -- is any 14:23	7 get no reflection. If you terminate another way, you 14:26
8 part of the data port in electrical communication? 14:23	8 might get a re- -- a reflection. But that reflection 14:26
9 The answer is yes. 14:23	9 is an instance of communication. Okay. 14:27
10 Is the ability of the driver to drive that 14:23	10 So is it an electrical communication? You 14:27
11 electrical communication when it's disabled? No. 14:24	11 bet. That's my answer. 14:27
12 So if -- I have to divide your question into 14:24	12 Q Okay. Just to clarify, is the die 14:27
13 two parts. The driver as a whole, any -- any 14:24	13 interconnect an electrical communication with the 14:27
14 component of electrical communication versus the 14:24	14 array die when the data port for the die is disabled? 14:27
15 active driver in electrical communication. 14:24	15 MR. RUECKHEIM: Object to the form. 14:27
16 And the answers could be different, depending 14:24	16 THE WITNESS: I -- you -- you just repeated 14:27
17 what you -- which part you're talking about. 14:24	17 the question. I -- I can repeat the answer. 14:27
18 MR. TEZYAN: Okay. 14:24	18 But my answer was, yes, it is, because of the 14:27
19 Q Let me ask a different question. 14:24	19 wave that goes back and forth when you -- when you 14:27
20 A Okay. 14:24	20 initiate a transaction. 14:27
21 Q Going back to Figure 1A, you see the 14:24	21 I'd like to bring up Exhibit 7 or 8, my book, 14:27
22 driver 134 on the control die? 14:24	22 again. I'll show you that picture. 14:28
23 A Okay. 14:24	23 MR. TEZYAN: Okay. Okay. There was no -- 14:28
24 Q Will driver 134 still experience a load 14:24	24 there was no question pending, sir. So we can -- we 14:28
25 that's attributable to the array die if the data port 14:24	25 can park that. And your counsel -- 14:28
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<p>1 THE WITNESS: Okay. 14:28</p> <p>2 MR. TEZYAN: -- can ask you as many questions 14:28</p> <p>3 as he wants about that on redirect. 14:28</p> <p>4 Q But I'm about to ask another question, so if 14:28</p> <p>5 you'd bear with me. 14:28</p> <p>6 A Was there a question? 14:28</p> <p>7 Q I'm about to ask another question. But if 14:28</p> <p>8 you'll bear with me just a moment. 14:28</p> <p>9 A I'm -- I'm not sure what you're asking me to 14:28</p> <p>10 do or not do. What -- what is it? 14:28</p> <p>11 MR. RUECKHEIM: I think he's saying there's 14:28</p> <p>12 no -- no question pending. 14:28</p> <p>13 THE WITNESS: No question pending. Okay. 14:28</p> <p>14 MR. TEZYAN: Q. Can you please go to 14:28</p> <p>15 paragraph 32 of your declaration. 14:28</p> <p>16 A Okay. I'm at 32. 14:28</p> <p>17 Q Okay. In the first sentence of paragraph 32, 14:29</p> <p>18 you say: 14:29</p> <p>19 "In the example of Fig. 2, 'die interconnect 14:29</p> <p>20 220a' -- 'may be in electrical communication with a 14:29</p> <p>21 data port from array die 210a.'" 14:29</p> <p>22 Do you see that? 14:29</p> <p>23 A I see that. 14:29</p> <p>24 Q Okay. And then in the following sentence, 14:29</p> <p>25 you say: 14:29</p> <p style="text-align: right;">Page 114</p>	<p>1 A There's a difference. 14:31</p> <p>2 Okay. Say -- what was the second question? 14:31</p> <p>3 Q My follow-up question was: What is that 14:31</p> <p>4 difference? 14:31</p> <p>5 A Well, let's assume that there is a stub on 14:31</p> <p>6 the -- on the array die that goes from the data 14:32</p> <p>7 interconnect towards the data port. And when you make 14:32</p> <p>8 an electrical connection for it to -- to sustain an 14:32</p> <p>9 electrical communication, that stub is connected to 14:32</p> <p>10 the driver. That stub will -- let's see -- that stub 14:32</p> <p>11 will be in electrical communication with the data 14:32</p> <p>12 port. 14:32</p> <p>13 Now, suppose you don't connect the stub to 14:32</p> <p>14 the data port. There's a gap between the stub and 14:32</p> <p>15 the -- and the data port. In that case, it is not in 14:32</p> <p>16 electrical communication with the data port, nor is 14:33</p> <p>17 it, in fact, electrically connected to the data port. 14:33</p> <p>18 So that's -- that's my distinction. 14:33</p> <p>19 Q Okay. Let's go back to Figure 1A, if we can. 14:33</p> <p>20 I just have a quick follow-up question on something 14:33</p> <p>21 you said previously. 14:33</p> <p>22 A Just a moment. Now -- got it. 14:33</p> <p>23 Q So you testified that even if the array die 14:34</p> <p>24 are disabled, it was disabled -- I'm sorry. Let me 14:34</p> <p>25 repeat the question. 14:34</p> <p style="text-align: right;">Page 116</p>
<p>1 "Die interconnect" -- 14:30</p> <p>2 I'm sorry. One moment. Okay. 14:30</p> <p>3 So in -- sorry. Strike that. 14:30</p> <p>4 Is there a difference between saying die 14:30</p> <p>5 interconnect 220a is in electrical communication with 14:30</p> <p>6 the data port from array die 210, versus die 14:30</p> <p>7 interconnect 220a is in electrical communication with 14:30</p> <p>8 array die 210? 14:31</p> <p>9 A That's hard for me to parse out. Now that I 14:31</p> <p>10 got the question, I know what to listen for and try to 14:31</p> <p>11 figure out -- 14:31</p> <p>12 Q Yeah, let me -- let me -- sorry. That was a 14:31</p> <p>13 bad question. 14:31</p> <p>14 So in paragraph 32, you say, quoting the 14:31</p> <p>15 patent: 14:31</p> <p>16 "'Die interconnect 220a' -- 'may be in 14:31</p> <p>17 electrical communication with a data port from array 14:31</p> <p>18 die 210a.'" 14:31</p> <p>19 And what I want to know is: Do you think, as 14:31</p> <p>20 a person of ordinary skill in the art, that there is a 14:31</p> <p>21 difference between being in electrical communication 14:31</p> <p>22 with a data port from array die versus being in 14:31</p> <p>23 electrical communication with the array die? 14:31</p> <p>24 A Yes. 14:31</p> <p>25 Q And what's that difference? 14:31</p> <p style="text-align: right;">Page 115</p>	<p>1 You testified earlier that if the data ports 14:34</p> <p>2 for an array die are disabled, there is still a load 14:34</p> <p>3 that's exerted on driver 134; right? 14:34</p> <p>4 A That's correct. 14:34</p> <p>5 Q Okay. Is the load reduced from a scenario 14:34</p> <p>6 where those drivers would be enabled? 14:34</p> <p>7 A Load reduced? 14:34</p> <p>8 Because of on-die termination and because 14:35</p> <p>9 the -- the on-die termination can change in time, it's 14:35</p> <p>10 controlled, I -- I don't know whether the load will be 14:35</p> <p>11 higher or greater or the same. It -- it's up in the 14:35</p> <p>12 air, so to speak. I don't have enough information to 14:35</p> <p>13 answer that question. 14:35</p> <p>14 Q What would it depend on? 14:35</p> <p>15 A Well, the load of the driver, when it's -- 14:35</p> <p>16 when it potentially can drive this -- this 110 depends 14:35</p> <p>17 on this -- on the termination at the driver. And the 14:35</p> <p>18 load that an external driver sees when the wave goes 14:35</p> <p>19 down to -- down the die interconnect to reach that 14:35</p> <p>20 driver depends on the load that the driver presents. 14:35</p> <p>21 That load depends on the on-die termination. So I 14:35</p> <p>22 can't tell what that is. 14:36</p> <p>23 Q Does the on-die termination load change if 14:36</p> <p>24 the driver is disabled or enabled? 14:36</p> <p>25 A That depends. I -- I don't know the answer. 14:36</p> <p style="text-align: right;">Page 117</p>



<p>1 Q Could you pull up Figure 2B from the 14:36</p> <p>2 '060 patent. 14:36</p> <p>3 A 2B? 14:36</p> <p>4 Q I'm sorry. Figure 2. There is no Figure 2B. 14:36</p> <p>5 A Of this patent? 14:37</p> <p>6 Q Yes, sir. 14:37</p> <p>7 A I have Figure 2. Okay. I've got Figure 2. 14:37</p> <p>8 Q Okay. And 210a through d, these are the 14:37</p> <p>9 array dies; correct? 14:37</p> <p>10 A Yes. 14:37</p> <p>11 Let me do something. Okay. I see it all 14:37</p> <p>12 now. Okay. 14:37</p> <p>13 Q And 220a, that's a die interconnect; right? 14:37</p> <p>14 A 220a is a die interconnect. That's correct. 14:37</p> <p>15 Q And these black circles through the array 14:37</p> <p>16 dies, that represents where the die interconnect is in 14:37</p> <p>17 electrical communication with the array die; is that 14:37</p> <p>18 correct? 14:37</p> <p>19 A That's correct. That's correct. 14:37</p> <p>20 Q Okay. So in Figure 2, array dies 210a and 14:37</p> <p>21 220b are in electrical communication with die 14:37</p> <p>22 interconnect 220a; right? 14:37</p> <p>23 A That's correct. 14:38</p> <p>24 Q And earlier, we were discussing the concept 14:38</p> <p>25 of rank. 14:38</p> <p style="text-align: right;">Page 118</p>	<p>1 THE WITNESS: If the system is set up so that 14:39</p> <p>2 a logical rank is broken in two pieces, one piece on 14:39</p> <p>3 one die inter- -- one array die, one piece on another 14:39</p> <p>4 array die; then if you accessed that rank sequentially 14:39</p> <p>5 by picking off the half that's in the lower die, 14:39</p> <p>6 subsequently picking off the part that's in the upper 14:40</p> <p>7 die, then you could do that. That -- that's an easy 14:40</p> <p>8 way. 14:40</p> <p>9 MR. TEZYAN: Q. You used the term "logical 14:40</p> <p>10 rank" there. What does that mean? 14:40</p> <p>11 A The rank appears to the memory controller on 14:40</p> <p>12 the other end of the system bus as being one cohesive 14:40</p> <p>13 rank. The controller doesn't know that actually, that 14:40</p> <p>14 rank is split on two different layers of a mem- -- of 14:40</p> <p>15 a memory. 14:40</p> <p>16 So when it asks to read a rank, the rank is 14:40</p> <p>17 delivered in one piece to the memory controller, but 14:40</p> <p>18 is ac- -- actually accessed in two pieces at the 14:40</p> <p>19 memory cells. 14:40</p> <p>20 Q Okay. But could array dies 210a and 210b be 14:40</p> <p>21 part of the same physical rank? 14:40</p> <p>22 MR. RUECKHEIM: Object to the form. 14:40</p> <p>23 MR. TEZYAN: Let me back up. Let me withdraw 14:40</p> <p>24 the question. 14:41</p> <p>25 Q What does a physical rank mean? 14:41</p> <p style="text-align: right;">Page 120</p>
<p>1 Do you remember that discussion? 14:38</p> <p>2 A I do. 14:38</p> <p>3 Q Now, could array dies 210a and 210b belong to 14:38</p> <p>4 the same rank? 14:38</p> <p>5 MR. RUECKHEIM: Object to the form. 14:38</p> <p>6 THE WITNESS: I don't have enough information 14:38</p> <p>7 to answer that question. 14:38</p> <p>8 MR. TEZYAN: Q. What additional information 14:38</p> <p>9 would you need? 14:38</p> <p>10 A I don't see the layout of ranks on those 14:38</p> <p>11 array dies. 14:38</p> <p>12 Q Is there any reason it could not belong to 14:38</p> <p>13 the same rank? 14:38</p> <p>14 A Let me hypothesize. If there are two ranks 14:38</p> <p>15 laid out on these two die interconnects, one rank is 14:38</p> <p>16 totally on one die -- array die, and the other rank is 14:38</p> <p>17 totally on the other array die. Okay. So they 14:39</p> <p>18 would -- what's on one die would not belong to the 14:39</p> <p>19 rank that's on another die. 14:39</p> <p>20 That's -- that's just one possibility. But 14:39</p> <p>21 there are other ways you can lay it out. 14:39</p> <p>22 Q Right. 14:39</p> <p>23 And is one of those other ways that array 14:39</p> <p>24 dies 210a and 210b could belong to the same rank? 14:39</p> <p>25 MR. RUECKHEIM: Object to the form. 14:39</p> <p style="text-align: right;">Page 119</p>	<p>1 MR. RUECKHEIM: Object to the form. 14:41</p> <p>2 THE WITNESS: Physical rank has changed over 14:41</p> <p>3 time. So I think one of ordinary skill in the art 14:41</p> <p>4 would believe a physical rank to be a layout of the 14:41</p> <p>5 cells physically. That's -- that's the best I can 14:41</p> <p>6 answer that. 14:41</p> <p>7 MR. TEZYAN: Okay. 14:41</p> <p>8 Q And with that understanding of physical rank, 14:41</p> <p>9 could 210a and 210b belong to the same physical rank? 14:41</p> <p>10 MR. RUECKHEIM: Same objection. 14:41</p> <p>11 THE WITNESS: I said that the notion of 14:41</p> <p>12 physical rank has changed over time. And one could 14:41</p> <p>13 decide to design a memory in which physical rank is 14:41</p> <p>14 split between two -- two layers of a memory cell. And 14:41</p> <p>15 that by doing it, your physical rank that's split 14:42</p> <p>16 between these two layers can imitate a physical rank 14:42</p> <p>17 memory cell, a memory cell where the physical rank is 14:42</p> <p>18 on one layer. 14:42</p> <p>19 And I think that would be reasonable for a 14:42</p> <p>20 person of ordinary skill in the art to understand at 14:42</p> <p>21 the time of the patent. 14:42</p> <p>22 MR. TEZYAN: Okay. 14:42</p> <p>23 Q So assuming array die 210a and 210b are in 14:42</p> <p>24 the same physical rank, how would they output data in 14:42</p> <p>25 parallel in response to a read command if they share 14:42</p> <p style="text-align: right;">Page 121</p>



<p>1 only one die interconnect? 14:42</p> <p>2 MR. RUECKHEIM: Object to the form. 14:42</p> <p>3 THE WITNESS: In this case, you show one die 14:42</p> <p>4 interconnect connecting those two -- those two layers. 14:43</p> <p>5 In fact, you could have a die interconnect for all the 14:43</p> <p>6 bits in a word. I mean, one -- each bit having its 14:43</p> <p>7 own individual die interconnect connecting those two 14:43</p> <p>8 layers, in which case the lowest layer could be 14:43</p> <p>9 outputting data on one set of die interconnects, while 14:43</p> <p>10 the layer above it outputs data on the other set of 14:43</p> <p>11 die interconnects at the same time. 14:43</p> <p>12 MR. TEZYAN: Okay. 14:43</p> <p>13 Q But in the configuration we have here where 14:43</p> <p>14 there is one die interconnect for data between 210a 14:43</p> <p>15 and 210b, and assuming that 210a and 210b are in the 14:43</p> <p>16 same physical rank, would it be possible to output 14:43</p> <p>17 data in parallel in response to a read command? 14:44</p> <p>18 A Yeah, you -- if they're the same physical 14:44</p> <p>19 rank. That doesn't mean they'll be driving the same 14:44</p> <p>20 die interconnect. Just put them on different die 14:44</p> <p>21 interconnects. 14:44</p> <p>22 Q In this configuration, though, they share the 14:44</p> <p>23 same die interconnect; right? 14:44</p> <p>24 A Yeah, but you're making an assumption that 14:44</p> <p>25 it's -- it becomes unreasonable. You can -- you can 14:44</p> <p style="text-align: right;">Page 122</p>	<p>1 could happen when there -- when one is ending its 14:45</p> <p>2 burst of data and the other one is beginning. That 14:45</p> <p>3 actually happens in memory chips so that momentarily, 14:46</p> <p>4 the drivers on those two layers, both belonging to the 14:46</p> <p>5 same rank, can be driving at the same time. You just 14:46</p> <p>6 have to be careful with the timing and the way the 14:46</p> <p>7 load is set up. You can design for that. 14:46</p> <p>8 (Document remotely marked Exhibit 11 14:47</p> <p>9 for identification.) 14:47</p> <p>10 MR. TEZYAN: I've introduced Exhibit 11. 14:47</p> <p>11 Q Can you please refresh your Exhibit Share. 14:47</p> <p>12 A Okay. 14:47</p> <p>13 Q And let me know when you have it. 14:47</p> <p>14 A Okay. I have refreshed. I see that I can 14:48</p> <p>15 access Exhibit 11. I'm about to download. 14:48</p> <p>16 Okay. I have Exhibit 11 in my reader. 14:48</p> <p>17 Q Okay. And Exhibit 11 is U.S. Patent 14:49</p> <p>18 Application No. 2011/0103156 to Kim et al.; right? 14:49</p> <p>19 A That's correct. 14:49</p> <p>20 Q And according to the Abstract, Kim discloses: 14:49</p> <p>21 "A data input/output circuit includes a rank 14:49</p> <p>22 selecting section and a data input/output section." 14:49</p> <p>23 Right? 14:49</p> <p>24 A I haven't read this patent before. I have to 14:49</p> <p>25 read it. 14:49</p> <p style="text-align: right;">Page 124</p>
<p>1 make an assumption for something that you can't build. 14:44</p> <p>2 Okay. 14:44</p> <p>3 And if you're telling me that you have a 14:44</p> <p>4 physical data on two die layers -- two array die 14:44</p> <p>5 layers, and they're all going to drive the same die 14:44</p> <p>6 interconnect at the same time, you know, I could say, 14:44</p> <p>7 Hey, yeah, that looks very strange. I don't think you 14:44</p> <p>8 can build that. 14:45</p> <p>9 So your hypothesis is bothering me. It's not 14:45</p> <p>10 something that I would encounter. A person of 14:45</p> <p>11 ordinary skill in the art would say, What are you 14:45</p> <p>12 doing here? 14:45</p> <p>13 So that's -- that's my answer. 14:45</p> <p>14 Q Okay. I'm trying to understand why that's 14:45</p> <p>15 your answer. 14:45</p> <p>16 So is it what we talked about earlier, that 14:45</p> <p>17 the risk of data collision in such a scenario prevents 14:45</p> <p>18 you from sort of sharing a common die interconnect for 14:45</p> <p>19 the 210a and 210b that are in the same physical rank 14:45</p> <p>20 there? 14:45</p> <p>21 MR. RUECKHEIM: Object to the form. 14:45</p> <p>22 THE WITNESS: I testified that it's -- it is 14:45</p> <p>23 the issue of collision that -- that bothers me. 14:45</p> <p>24 And I also testified that they can -- the two 14:45</p> <p>25 bits that are driving the same line at the same time 14:45</p> <p style="text-align: right;">Page 123</p>	<p>1 Q Okay. Take your time. But I'm just asking 14:49</p> <p>2 you to confirm what the Abstract says. 14:49</p> <p>3 A So you're only going to ask me about the 14:49</p> <p>4 Abstract; is that it? 14:49</p> <p>5 Q For now, yes. 14:49</p> <p>6 A Okay. 14:49</p> <p>7 Q But if you'd like to take a minute and review 14:49</p> <p>8 it, you can go ahead. 14:49</p> <p>9 A I would like to. 14:49</p> <p>10 Q Please. 14:49</p> <p>11 A Okay. I -- I think I understand some aspects 14:51</p> <p>12 of it. I might not be able to answer your question, 14:51</p> <p>13 but go ahead. 14:51</p> <p>14 Q I'll just repeat what my first question was: 14:51</p> <p>15 According to the Abstract, Kim discloses: 14:51</p> <p>16 "A data input/output circuit includes a rank 14:51</p> <p>17 selecting section and a data input/output section." 14:51</p> <p>18 Right? 14:51</p> <p>19 A That is correct. 14:51</p> <p>20 Q Okay. And: 14:51</p> <p>21 "The rank selecting section is selectively 14:51</p> <p>22 connected to one of the first and second ranks in 14:51</p> <p>23 response to a chip selection signal, and outputs data 14:52</p> <p>24 to a connected rank or receives data from the 14:52</p> <p>25 connected rank." 14:52</p> <p style="text-align: right;">Page 125</p>

<p>1 Did I read that correctly? 14:52</p> <p>2 A You did. 14:52</p> <p>3 Q Okay. So the use of chip select signals for 14:52</p> <p>4 rank selection is common in DRAM-based memory systems; 14:52</p> <p>5 right? 14:52</p> <p>6 A It -- it's -- yes, it's -- it's -- it's used 14:52</p> <p>7 in practice. 14:52</p> <p>8 Q Okay. So fair to say that Kim is discussing 14:52</p> <p>9 a DRAM-based memory system? 14:52</p> <p>10 MR. RUECKHEIM: Object to the form; beyond 14:52</p> <p>11 the scope. 14:52</p> <p>12 THE WITNESS: Okay. Would you repeat your 14:52</p> <p>13 question, please. 14:53</p> <p>14 MR. TEZYAN: Sure. 14:53</p> <p>15 Q The question was: Is it fair to say that Kim 14:53</p> <p>16 is discussing a DRAM-based memory system -- 14:53</p> <p>17 A I just searched. I did not see any reference 14:53</p> <p>18 to D-R-A-M, DRAM. So I'd have to read the patent 14:53</p> <p>19 carefully to decide if it's talking about DRAM or 14:54</p> <p>20 something else. 14:54</p> <p>21 Q Okay. Designs for DRAM memory system 14:54</p> <p>22 organization, can they readily be applied to other 14:54</p> <p>23 types of memory systems, such as SRAM or NAND? 14:54</p> <p>24 Let me -- let me withdraw the question. 14:54</p> <p>25 Sorry. So let me ask it slightly differently. 14:54</p> <p style="text-align: right;">Page 126</p>	<p>1 THE VIDEOGRAPHER: We are going back on the 15:06</p> <p>2 record. The time is 3:06 p.m. 15:06</p> <p>3 And this is the start of Media Unit No. 7. 15:06</p> <p>4 (Document remotely marked Exhibit 12 15:06</p> <p>5 for identification.) 15:06</p> <p>6 MR. TEZYAN: I'm going to go ahead and upload 15:06</p> <p>7 a new exhibit. 15:06</p> <p>8 Q Dr. Stone, could you please refresh your 15:06</p> <p>9 Exhibit Share, and let me know when it comes up, 15:06</p> <p>10 please. 15:07</p> <p>11 A Okay. I see Exhibit 11. I'm about to 15:07</p> <p>12 download. 15:07</p> <p>13 Q It should be Exhibit 12, I believe. 15:07</p> <p>14 A All right. 15:07</p> <p>15 We actually already had that one. All right. 15:07</p> <p>16 Try it again. 15:07</p> <p>17 Ah, I've got 12. I am about to download. 15:07</p> <p>18 Q Let me know when you have it, please. 15:08</p> <p>19 A I am just -- I have it now. I have it in 15:08</p> <p>20 front of me. 15:08</p> <p>21 Q Okay. And this is U.S. Patent Application 15:08</p> <p>22 2011/0026293 to Riho; is that correct? 15:08</p> <p>23 A That's correct. That's what I see. 15:08</p> <p>24 Q Okay. And I'd just like to bring up an 15:08</p> <p>25 example just to get a -- make sure I understand your 15:08</p> <p style="text-align: right;">Page 128</p>
<p>1 So there are other types of -- sorry. 14:54</p> <p>2 There are multiple types of memory systems, 14:54</p> <p>3 right, such as SRAM? 14:54</p> <p>4 A That's correct. 14:54</p> <p>5 Q And NAND is another type of memory system? 14:54</p> <p>6 A That's correct. 14:54</p> <p>7 Q N-O-R, is that another type of memory system? 14:54</p> <p>8 A Can you -- for the record, can you just tell 14:55</p> <p>9 me what the acronym is? 14:55</p> <p>10 Q NOR is another type of non-volatile -- 14:55</p> <p>11 A Yes, because it's NAND and NOR, yes. 14:55</p> <p>12 Q Yes. Okay. 14:55</p> <p>13 So designs for DRAM memory systems can be 14:55</p> <p>14 readily applied to these other non-DRAM memory 14:55</p> <p>15 systems: SRAM, NAND, NOR; right? 14:55</p> <p>16 A No. No. 14:55</p> <p>17 I'm sorry. Did you hear me? I said, "No." 14:56</p> <p>18 Q Oh, yes, I heard you. Sorry. I'm just 14:56</p> <p>19 gathering my thoughts. 14:56</p> <p>20 Why don't we go ahead and take a quick break. 14:56</p> <p>21 A Okay. 14:56</p> <p>22 THE VIDEOGRAPHER: We are going off the 14:56</p> <p>23 record. The time is 2:56 p.m. 14:56</p> <p>24 And this is the end of Media Unit No. 6. 14:56</p> <p>25 (Recess taken.) 14:56</p> <p style="text-align: right;">Page 127</p>	<p>1 testimony with electrical communication and not an 15:08</p> <p>2 electrical communication. 15:08</p> <p>3 A Okay. 15:08</p> <p>4 Q If you'll just bear with me for a few 15:08</p> <p>5 minutes. 15:08</p> <p>6 So if you'd go to paragraph 69. 15:08</p> <p>7 And by the way, I'm -- why don't you take a 15:08</p> <p>8 minute or two and just read this before I launch into 15:08</p> <p>9 the description. 15:08</p> <p>10 A I'd like to. 15:08</p> <p>11 When you said "69," would that be in my 15:08</p> <p>12 report? 15:08</p> <p>13 Q Yes, I'm -- what's that? 15:08</p> <p>14 Oh, no. Paragraph 69 of -- of this exhibit, 15:09</p> <p>15 sir. 15:09</p> <p>16 A There's paragraph 69. Okay. Let me look. 15:09</p> <p>17 (Reading document.) 15:12</p> <p>18 Okay. I'm ready. 15:12</p> <p>19 Q Okay. So referring to Figure 4 of Riho. 15:12</p> <p>20 A Okay. 15:12</p> <p>21 Q Can we agree, based on the description, that 15:12</p> <p>22 only SDRAM device D15 and D7 are on? 15:13</p> <p>23 A Well, point me to the description. I -- I 15:13</p> <p>24 looked at the patent, but I'm not -- I can't -- I 15:13</p> <p>25 can't comment until you tell me what to look at. 15:13</p> <p style="text-align: right;">Page 129</p>

<p>1 Q Fair enough. 15:13</p> <p>2 So for starters, in Figure 4 for the 15:13</p> <p>3 SDRAM D15 that's connected to TSV15, you see that it 15:13</p> <p>4 says "ON"; correct? 15:13</p> <p>5 A Okay. 15:13</p> <p>6 Q And then go ahead and review paragraph 74. 15:13</p> <p>7 A There's a lot here. I mean, it -- in 74, 15:14</p> <p>8 there's a context that I haven't read. It's -- this 15:14</p> <p>9 is going to be very difficult for me to comment on in 15:14</p> <p>10 such a short time. 15:14</p> <p>11 Q Okay. Well, let's go to paragraph 72, okay, 15:14</p> <p>12 where the switch -- the set indication signal for the 15:15</p> <p>13 chip switch circuit is described. And I'm talking 15:15</p> <p>14 about D715. 15:15</p> <p>15 A I see D715, yes. 15:15</p> <p>16 Q Okay. And in the next paragraph, in 73, it 15:15</p> <p>17 says that: 15:15</p> <p>18 "In the chip switch circuit CS7 of the 15:15</p> <p>19 SDRAM D7" -- and -- "SDRAM D15, the switch sa which is 15:15</p> <p>20 given the set indication signal D715 and the second 15:15</p> <p>21 group" -- "is put in an off state." 15:15</p> <p>22 Right? 15:15</p> <p>23 A The conversely bothers me. There's something 15:15</p> <p>24 I haven't read about the opposite of that. Is it in 15:15</p> <p>25 72? 15:15</p> <p style="text-align: right;">Page 130</p>	<p>1 "The memory system 1010." 15:18</p> <p>2 Is that correct? 15:18</p> <p>3 Q Yeah, that's correct. 15:18</p> <p>4 Could you review this passage to yourself. 15:18</p> <p>5 A Yes, I will. 15:18</p> <p>6 (Reading document.) 15:18</p> <p>7 And the passage you referred to is just that 15:19</p> <p>8 one paragraph; is that correct? 15:19</p> <p>9 Q Yes, sir. The paragraph that ends on 15:19</p> <p>10 column 25, line 7. 15:19</p> <p>11 A That's fine. I have reviewed it. 15:19</p> <p>12 Q Okay. So the passage says that: 15:19</p> <p>13 "The memory system 1010 may transition from 15:19</p> <p>14 the first state to the second state in response to a 15:19</p> <p>15 trigger condition, such as when the memory system 1010 15:19</p> <p>16 detects that there is a power interruption (e.g., 15:19</p> <p>17 power failure or reduction) or a system hang-up." 15:19</p> <p>18 Right? 15:19</p> <p>19 A That's correct. 15:19</p> <p>20 Q So would a person of ordinary skill in the 15:19</p> <p>21 art understand that in the second state, the module 15:19</p> <p>22 may be in, for example, a power failure? 15:19</p> <p>23 MR. RUECKHEIM: Object to the form. 15:19</p> <p>24 THE WITNESS: Ask your question again, 15:20</p> <p>25 please. 15:20</p> <p style="text-align: right;">Page 132</p>
<p>1 Q Uh-huh. 15:15</p> <p>2 A (Reading document.) 15:15</p> <p>3 Okay. I vaguely understand what's going on, 15:16</p> <p>4 but go ahead. 15:16</p> <p>5 Q Okay. So returning to Figure 4, so do you 15:16</p> <p>6 understand from that description that SDRAM 15 along 15:16</p> <p>7 TSV15 is enabled? 15:16</p> <p>8 MR. RUECKHEIM: Object to the form, and 15:16</p> <p>9 beyond the scope. 15:16</p> <p>10 THE WITNESS: I'm sorry. All I saw in the 15:16</p> <p>11 description was something was turned on. Something 15:16</p> <p>12 was turned off. I -- I -- I don't see the 15:16</p> <p>13 connectivity yet. 15:16</p> <p>14 I need to look at this patent and study it. 15:16</p> <p>15 I -- I'm sorry. I -- very difficult for me to answer 15:17</p> <p>16 these questions. 15:17</p> <p>17 MR. TEZYAN: Q. Can you please return to the 15:17</p> <p>18 '918 patent. 15:17</p> <p>19 A Exhibit what? 15:17</p> <p>20 Q That is Exhibit 4. 15:17</p> <p>21 A I have it. 15:17</p> <p>22 Q Okay. And if you'll bear with me just a 15:17</p> <p>23 second. 15:17</p> <p>24 Could you please go to column 24, line 60. 15:18</p> <p>25 A Okay. I see at line 60. It starts: 15:18</p> <p style="text-align: right;">Page 131</p>	<p>1 MR. TEZYAN: Q. Would a person of ordinary 15:20</p> <p>2 skill in the art understand that in the second state, 15:20</p> <p>3 the memory module may be in, for example, a power 15:20</p> <p>4 failure? 15:20</p> <p>5 MR. RUECKHEIM: Same objection. 15:20</p> <p>6 THE WITNESS: I'm reading the text, and it 15:20</p> <p>7 says that it may transition from the first state to 15:20</p> <p>8 the second state, such as when the memory system 15:20</p> <p>9 detects that there is a power interruption; for 15:20</p> <p>10 example, power failure. 15:20</p> <p>11 I think that what you're asking is, is it 15:20</p> <p>12 true that the patent teaches that? 15:20</p> <p>13 As far as I can tell, the answer is yes. 15:20</p> <p>14 MR. TEZYAN: Okay. Let me ask a slightly 15:20</p> <p>15 different question then. 15:21</p> <p>16 Q Does the patent teach that the memory module 15:21</p> <p>17 in the second operable state can be a state in which 15:21</p> <p>18 there is a power reduction? 15:21</p> <p>19 MR. RUECKHEIM: Object to the form, and 15:21</p> <p>20 beyond the scope. 15:21</p> <p>21 THE WITNESS: A power reduction? 15:21</p> <p>22 (Reading document.) 15:21</p> <p>23 I'm looking at information that may be useful 15:21</p> <p>24 to answer at column 20. And the information says the 15:22</p> <p>25 trigger condition -- it describes a trigger condition 15:23</p> <p style="text-align: right;">Page 133</p>

<p>1 in the first sentence, and it says that the -- for 15:23</p> <p>2 example, power failure. 15:23</p> <p>3 So I'm informed that the trigger condition 15:23</p> <p>4 can be a power failure. It does describe certain 15:23</p> <p>5 embodiments, but it doesn't describe for all. 15:23</p> <p>6 Then it says something about the power module 15:23</p> <p>7 may switch, but it doesn't relate the switch to the 15:23</p> <p>8 trigger condition. It says that the -- when no power 15:23</p> <p>9 failure is detected, the power module may provide 15:23</p> <p>10 power to certain components, maybe not others. 15:23</p> <p>11 So it -- the power module trigger could be a 15:23</p> <p>12 power failure, but it's not necessarily, and it may 15:23</p> <p>13 not be in every embodiment. So I -- I don't have a 15:23</p> <p>14 firm view of what the trigger condition might be. 15:23</p> <p>15 MR. TEZYAN: I'll just object that that's 15:24</p> <p>16 nonresponsive, because I didn't ask about the trigger 15:24</p> <p>17 condition, and I'll move to strike. 15:24</p> <p>18 THE WITNESS: Well, I'm sorry. Ask your 15:24</p> <p>19 question again, and I'll do it my best to answer it. 15:24</p> <p>20 MR. TEZYAN: Yeah. No problem. 15:24</p> <p>21 Q Let me direct your attention back to 15:24</p> <p>22 column 24. And actually, more specifically, column 15:24</p> <p>23 25. This is line 3 through 7. 15:24</p> <p>24 And -- and so one example here that it 15:24</p> <p>25 discusses with the trigger condition is a power 15:24</p> <p style="text-align: right;">Page 134</p>	<p>1 MR. TEZYAN: Q. So the question was: Does 15:26</p> <p>2 the patent teach that the memory module in the second 15:26</p> <p>3 operable state could be in a state where there's a 15:26</p> <p>4 power reduction? 15:26</p> <p>5 MR. RUECKHEIM: Object to the form. 15:26</p> <p>6 THE WITNESS: I'm informed by lines 54 15:26</p> <p>7 through 58 of that same paragraph -- of the same 15:27</p> <p>8 column 25 -- let me see. 15:27</p> <p>9 Oh, I'm sorry. I messed it up. 15:28</p> <p>10 At line 54, it says: 15:28</p> <p>11 "Power may be supplied to the volatile memory 15:28</p> <p>12 subsystem 1030 from a first power supply (e.g., a 15:28</p> <p>13 system power supply) when the memory system 1010 is in 15:28</p> <p>14 the first state and from a second power supply 1080 15:28</p> <p>15 when the memory system 1010 is in the second state." 15:28</p> <p>16 So this question is when the power supply is 15:28</p> <p>17 in the second state, it can supply power to the 15:29</p> <p>18 volatile memory system. And from what we saw earlier, 15:29</p> <p>19 it can reach that second state by a power reduction. 15:29</p> <p>20 And that's -- I think that teaches what you're asking 15:29</p> <p>21 about. 15:29</p> <p>22 MR. TEZYAN: Yeah, let me just -- my -- my 15:29</p> <p>23 question is not intended to be tricky, sir. So let me 15:29</p> <p>24 just make it a little clearer. 15:29</p> <p>25 Q If we'd go back to row 3 -- sorry -- line 3 15:29</p> <p style="text-align: right;">Page 136</p>
<p>1 reduction; right? 15:24</p> <p>2 It says: 15:24</p> <p>3 "(e.g., power failure or reduction)." 15:24</p> <p>4 A That's -- 15:24</p> <p>5 Q Correct? 15:24</p> <p>6 A -- that's correct. That's right. 15:24</p> <p>7 Q Okay. So with that in mind, does the patent 15:24</p> <p>8 teach that the memory module in the second operable 15:24</p> <p>9 state can be a state in which there is a power 15:24</p> <p>10 reduction? 15:24</p> <p>11 MR. RUECKHEIM: Object to the form. 15:24</p> <p>12 THE WITNESS: Ask your question again, 15:25</p> <p>13 please. 15:25</p> <p>14 MR. TEZYAN: Sure. 15:25</p> <p>15 Q Does the patent teach that the memory module 15:25</p> <p>16 in the second operable state could be in a state where 15:25</p> <p>17 there is a power reduction? 15:25</p> <p>18 MR. RUECKHEIM: Object to the form. 15:25</p> <p>19 THE WITNESS: Are you talking about the whole 15:25</p> <p>20 memory module? 15:25</p> <p>21 MR. TEZYAN: Correct, sir. 15:25</p> <p>22 THE WITNESS: And your question again was, if 15:26</p> <p>23 you have a power interruption, something happens. 15:26</p> <p>24 What was the hypothesis? 15:26</p> <p>25 If you have a power reduction, then -- 15:26</p> <p style="text-align: right;">Page 135</p>	<p>1 of column 25, right, it says that: 15:29</p> <p>2 "The memory system 1010 may transition from 15:29</p> <p>3 the first state to the second state in response to a 15:29</p> <p>4 trigger condition, such as when the memory system 1010 15:29</p> <p>5 detects that there is a power interruption (e.g., 15:29</p> <p>6 power failure or reduction) or a system hang-up." 15:29</p> <p>7 And my question is: Would a person of 15:29</p> <p>8 ordinary skill in the art reading the specification of 15:29</p> <p>9 the '918 patent understand that the second operable 15:30</p> <p>10 state could refer to a state in which there is a power 15:30</p> <p>11 reduction? 15:30</p> <p>12 MR. RUECKHEIM: Object to the form. 15:30</p> <p>13 THE WITNESS: There are lots of "if"s and 15:30</p> <p>14 "but"s and things. It may transition, and this is in 15:30</p> <p>15 certain embodiments. All I can say is that in certain 15:30</p> <p>16 embodiments, there may be a transition to the second 15:30</p> <p>17 state when there is a power reduction. 15:30</p> <p>18 MR. TEZYAN: Q. Memory modules typically 15:30</p> <p>19 have memory devices on them; right? 15:31</p> <p>20 A Yes, that is correct. 15:31</p> <p>21 Q And -- and those memory devices require power 15:31</p> <p>22 to operate; right? 15:31</p> <p>23 A No. 15:31</p> <p>24 Q They can operate without power? 15:31</p> <p>25 A Well, your word "operate" bothers me. 15:31</p> <p style="text-align: right;">Page 137</p>

<p>1 There's non-volatile memory, and part of its operation 15:31</p> <p>2 is storage. It's true that non-volatile memory can 15:31</p> <p>3 store data without power. 15:31</p> <p>4 Q Okay. So let's just say on a memory module, 15:31</p> <p>5 we have volatile memory and non-volatile memory; 15:31</p> <p>6 right? 15:31</p> <p>7 A You'll have to repeat that. 15:31</p> <p>8 Q Let's say on a memory module, we have 15:32</p> <p>9 volatile memory and non-volatile memory? 15:32</p> <p>10 A It has volatile and non-volatile memory on 15:32</p> <p>11 this module? 15:32</p> <p>12 Q Yes. 15:32</p> <p>13 A Yes. 15:32</p> <p>14 Q The volatile memory will require power to 15:32</p> <p>15 operate; is that right? 15:32</p> <p>16 A Yes. 15:32</p> <p>17 Q Okay. So if there is a power loss, the 15:32</p> <p>18 volatile memory will no longer operate; is that right? 15:32</p> <p>19 A The answer is "yes" and "no." 15:32</p> <p>20 Q What do you mean? 15:32</p> <p>21 A When you say "will no longer operate," the 15:32</p> <p>22 answer is, it will be able to operate for a little 15:32</p> <p>23 bit, for a while. Okay. 15:32</p> <p>24 Q Why would it be able to operate for a while? 15:32</p> <p>25 A When there is a power failure, there may be 15:32</p> <p style="text-align: right;">Page 138</p>	<p>1 A Depends. 15:34</p> <p>2 Q Depends on what? 15:34</p> <p>3 A The register can be maintained in a state 15:34</p> <p>4 after you lose power if it is programmed to -- like in 15:34</p> <p>5 an FPGA, to retain state when it loses power. And you 15:34</p> <p>6 can do that essentially by storing or not storing 15:34</p> <p>7 charge in various places. 15:34</p> <p>8 Q Okay. So would a person of ordinary skill in 15:34</p> <p>9 the art understand that a non-volatile memory that's 15:35</p> <p>10 part of an FPGA could be a register? 15:35</p> <p>11 MR. RUECKHEIM: Object to the form. 15:35</p> <p>12 THE WITNESS: I think a person of ordinary 15:35</p> <p>13 skill in the art, if asked that question, would 15:35</p> <p>14 consider the options of how one might build that and 15:35</p> <p>15 would decide, Yeah, I can build a register that is 15:35</p> <p>16 non-volatile on an FPGA if I could do this and this 15:35</p> <p>17 and this on the FPGA. 15:35</p> <p>18 MR. TEZYAN: Q. Let's jump to paragraph 37 15:35</p> <p>19 of your declaration. And that's Exhibit 1. 15:36</p> <p>20 A I'm at 37, and this is the proposed 15:36</p> <p>21 construction for driver size. 15:36</p> <p>22 Q Yes, sir. 15:36</p> <p>23 So Micron's proposed construction is that: 15:36</p> <p>24 "The physical dimensions of the second driver 15:36</p> <p>25 being different from the physical dimensions of the 15:36</p> <p style="text-align: right;">Page 140</p>
<p>1 enough voltage available in storage devices sitting 15:32</p> <p>2 around that will supply the power needed to operate it 15:33</p> <p>3 until those storage devices and capacitors and 15:33</p> <p>4 whatever exhaust their reserve power. 15:33</p> <p>5 Q Okay. So in that scenario, the memory -- 15:33</p> <p>6 sorry. Let me make that question clearer. I 15:33</p> <p>7 withdraw. 15:33</p> <p>8 So in that scenario, the volatile memory 15:33</p> <p>9 would still be operating; right? 15:33</p> <p>10 A Which scenario, now? 15:33</p> <p>11 Q The scenario where there is a power failure, 15:33</p> <p>12 it's your testimony that the volatile memory would 15:33</p> <p>13 still be operating; right? 15:33</p> <p>14 A For a while, not -- not indefinitely. 15:33</p> <p>15 Q And the non-volatile memory would be 15:33</p> <p>16 operating as well; right? 15:33</p> <p>17 A In the sense that its operation allows it to 15:34</p> <p>18 store data without losing it. And in that -- if that 15:34</p> <p>19 satisfies your definition of operation, it will be 15:34</p> <p>20 operating. 15:34</p> <p>21 Q What are some examples of non-volatile 15:34</p> <p>22 memory? 15:34</p> <p>23 A Flash memory. 15:34</p> <p>24 Q Is a register an example of non-volatile 15:34</p> <p>25 memory? 15:34</p> <p style="text-align: right;">Page 139</p>	<p>1 first driver." 15:36</p> <p>2 Do I have that right? 15:36</p> <p>3 A You do. 15:36</p> <p>4 Q What do you mean by "physical dimensions"? 15:36</p> <p>5 A Physical dimension is length, width, area, 15:36</p> <p>6 the physical size of the driver on the die. 15:37</p> <p>7 Q What is it that you believe the physical size 15:37</p> <p>8 is comprised of? 15:37</p> <p>9 MR. RUECKHEIM: Object to the form. 15:37</p> <p>10 THE WITNESS: You measure it. You -- you 15:37</p> <p>11 look at the driver on the die, and you find it's so 15:37</p> <p>12 many millimeters by so many millimeters. Those are 15:37</p> <p>13 physical dimensions. 15:37</p> <p>14 MR. TEZYAN: Okay. 15:37</p> <p>15 Q Let's jump to paragraph 42 of your 15:38</p> <p>16 declaration. 15:38</p> <p>17 A Okay. Okay. 15:38</p> <p>18 Q And you say that: 15:38</p> <p>19 "'Driver size' refers to the physical 15:38</p> <p>20 dimensions of the driver such as the following 15:38</p> <p>21 portions of the specification below which refers to 15:38</p> <p>22 the amount of space a driver takes up on a die or the 15:38</p> <p>23 number of physical transistors directly relating to 15:38</p> <p>24 the size of the die." 15:38</p> <p>25 Is that right? 15:38</p> <p style="text-align: right;">Page 141</p>



<p>1 A That's what I say. That's correct. 15:38</p> <p>2 Q Okay. So if you have a driver circuit that 15:38</p> <p>3 has a set of transistors, what is the size of that 15:38</p> <p>4 driver circuit? 15:38</p> <p>5 A It's the physical dimension of the driver. 15:39</p> <p>6 Q So is it the combination of those two 15:39</p> <p>7 transistors? 15:39</p> <p>8 A Those two transistors will lie in an area 15:39</p> <p>9 that you identify as the driver. The size of the 15:39</p> <p>10 driver is the -- is related to the length and width of 15:39</p> <p>11 that area that -- that encloses those transistors. 15:39</p> <p>12 Q Okay. Let me put it another way. Say you 15:39</p> <p>13 have a driver circuit that comprises a number of 15:39</p> <p>14 transistors; let's say ten transistors. 15:39</p> <p>15 A Okay. 15:39</p> <p>16 Q And then for a particular load, you use a 15:39</p> <p>17 subset of transistors; say, two transistors. And for 15:39</p> <p>18 other loads, you use all of the transistors; i.e., ten 15:39</p> <p>19 transistors. 15:40</p> <p>20 Are you with me so far? 15:40</p> <p>21 A So far. 15:40</p> <p>22 Q Okay. In that circumstance, what is the 15:40</p> <p>23 physical dimension of the driver? 15:40</p> <p>24 A The length and width of the area that's 15:40</p> <p>25 occupied by those transistors. 15:40</p> <p style="text-align: right;">Page 142</p>	<p>1 So again, it says that space and power that 15:41</p> <p>2 you have are related, but they're not the same, and it 15:41</p> <p>3 distinguishes the space from power. 15:41</p> <p>4 But we're not even done yet. Let's open the 15:42</p> <p>5 patent, the '160 patent. 15:42</p> <p>6 Do we have an exhibit for it? 15:42</p> <p>7 Or the '060. We have an '060, Exhibit 9. 15:42</p> <p>8 Can we look there? 15:42</p> <p>9 Q Sure. 15:42</p> <p>10 A Just a moment. I'll still looking. 15:43</p> <p>11 Q That's fine. Take your time. 15:43</p> <p>12 A I got it. It's on -- it's on column 4. 15:43</p> <p>13 Q Okay. 15:43</p> <p>14 A Okay. Let me -- I lost it for a second. I 15:43</p> <p>15 took my... 15:43</p> <p>16 Ah, it's in column 17. I was looking in the 15:43</p> <p>17 wrong place. 15:44</p> <p>18 Q Okay. 15:44</p> <p>19 A Oh, I think we already have this. 15:44</p> <p>20 There was one other place. This is in my 15:44</p> <p>21 report, column 17. 15:44</p> <p>22 Q Uh-huh. 15:44</p> <p>23 A A larger driver also consumes -- let me see 15:44</p> <p>24 if I can find what I'm looking for. Now I know what 15:44</p> <p>25 to look for. 15:45</p> <p style="text-align: right;">Page 144</p>
<p>1 Q So all ten transistors? 15:40</p> <p>2 A If they -- if they are in that driver, then 15:40</p> <p>3 all ten transistors. 15:40</p> <p>4 Q So are you saying that the driver size 15:40</p> <p>5 doesn't depend on how many transistors are used to 15:40</p> <p>6 actively drive a load? 15:40</p> <p>7 A I think that's answered right here by the 15:40</p> <p>8 patent itself. We're on the page. Okay. I would 15:40</p> <p>9 like you to look at the top of page 15 in my report 15:40</p> <p>10 where there's a quote. And it's the last sentence of 15:40</p> <p>11 that quote says: 15:40</p> <p>12 "However, generally a larger driver not only 15:40</p> <p>13 consumes more space on the control die, but also 15:40</p> <p>14 consumes more power." 15:41</p> <p>15 Now, what this teaches is that we're talking 15:41</p> <p>16 about space on the control die. And more often than 15:41</p> <p>17 not, maybe when you have bigger space, you can do more 15:41</p> <p>18 power. But it is distinguishing space from power or 15:41</p> <p>19 strength. 15:41</p> <p>20 We're not done. Go down. There are three 15:41</p> <p>21 quotes on that page. Let's take a look at the last 15:41</p> <p>22 quote. You see where they have bold text? Then after 15:41</p> <p>23 the bold text, it says: 15:41</p> <p>24 "A larger driver often consumes more power 15:41</p> <p>25 than a smaller driver." 15:41</p> <p style="text-align: right;">Page 143</p>	<p>1 Ah, I did find it. This is in column 4. I 15:45</p> <p>2 just didn't see it. I'm looking at line 22: 15:45</p> <p>3 "In certain embodiments, reducing one or both 15:45</p> <p>4 of driver size and driver power consumption may be 15:45</p> <p>5 accomplished by increasing the number of die 15:45</p> <p>6 interconnects" -- 15:45</p> <p>7 Et cetera, et cetera. 15:45</p> <p>8 But I want to point out that this sentence 15:45</p> <p>9 distinguishes driver size from driver power. They are 15:45</p> <p>10 different. It says "one or both of." 15:46</p> <p>11 So I've given you three places where the 15:46</p> <p>12 patent teaches that size is what they're interested 15:46</p> <p>13 in. And that's distinguished from power, but they're 15:46</p> <p>14 related. That's my testimony. 15:46</p> <p>15 Q Is driver power consumption the same thing as 15:46</p> <p>16 driver strength? 15:46</p> <p>17 A I haven't opined on that. Here, the patent 15:46</p> <p>18 teaches about power. I think one of ordinary skill in 15:47</p> <p>19 the art might believe that strength and power are 15:47</p> <p>20 related. That's a reasonable position to take for a 15:47</p> <p>21 person of ordinary skill in the art. If we get down 15:47</p> <p>22 to places where they actually may be different, well, 15:47</p> <p>23 okay. That can happen, too. 15:47</p> <p>24 Q Okay. So just so the record is clear, 15:47</p> <p>25 because I asked the short question and got a helpful 15:47</p> <p style="text-align: right;">Page 145</p>



1 but long answer, is it your testimony that the driver 15:47	1 A I don't know exactly, but the answer is it 15:50
2 size doesn't depend on how many transistors are 15:48	2 could be. 15:50
3 actively being used? 15:48	3 Q Okay. When would it not be determined by 15:50
4 A The driver size in this patent is taught to 15:48	4 those ten transistors? 15:50
5 be the area of the driver or the physical dimensions 15:48	5 A Ask your question again, because I think I 15:50
6 of the driver. And so it does not depend on the 15:48	6 misunderstood it. 15:50
7 number of transistors that are actually being used. 15:48	7 Q Sure. 15:50
8 Q Okay. So if only two of the ten transistors 15:48	8 The -- the question is -- and I think I know 15:50
9 are used to drive a load, is the physical size of the 15:48	9 the answer, based on your testimony, but I just want 15:50
10 driver determined by the ten transistors or the two 15:48	10 to make sure we're absolutely clear. 15:50
11 transistors? 15:48	11 So if only two of the ten transistors are 15:50
12 A Are you saying that you'll never use 15:48	12 used to drive a load, is the physical size of the 15:50
13 transistors? Is that your assumption? 15:48	13 drive -- the driver determined by ten transistors or 15:51
14 Q No. 15:48	14 two transistors? 15:51
15 I'm just saying for purposes of my 15:48	15 A My answer is going to be determined by the 15:51
16 hypothetical, right, you have a driver that's composed 15:48	16 two transistors, because the size of the driver has to 15:51
17 of ten transistors; right? 15:48	17 be able to dissipate the power of whatever is in 15:51
18 A I understand. 15:48	18 there. And if those two transistors are driving like 15:51
19 Q Okay. And for the particular load that's on 15:48	19 mad, and that would -- might be the case, then you 15:51
20 this driver, you're using two of the ten transistors 15:49	20 have to make enough area to dissipate the heat. 15:51
21 for driving. 15:49	21 You just told me that you're never going to 15:51
22 Does that make sense? 15:49	22 drive the other eight, if I understand the hypothesis. 15:51
23 A That makes sense. 15:49	23 Q No. 15:51
24 Q Okay. So if only two of the ten transistors 15:49	24 So -- 15:51
25 are used to drive a load, is the physical size of the 15:49	25 A Okay. 15:51
Page 146	
1 driver determined by the ten transistors or the two 15:49	1 Q -- I'll -- I'll -- I'll ask the question 15:51
2 transistors? 15:49	2 again: You have -- you have a driver that is 15:51
3 A I asked a question: Do you ever turn on all 15:49	3 comprised of ten transistors; right? 15:51
4 ten transistors? 15:49	4 A Yes. 15:51
5 Q You could. But in this situation, you're 15:49	5 Q Okay. And you can use the ten transistors to 15:51
6 just using two. 15:49	6 drive a load, or you can use a subset of those 15:51
7 A I think you answered my question. If you can 15:49	7 transistors, in this example two, to drive a load. 15:51
8 turn on all ten, the driver size is related to the 15:49	8 A I understand. 15:52
9 load that you can drive. And if you're going to drive 15:49	9 Q Okay. In this hypothetical, is the physical 15:52
10 ten transistors, you have to have enough area to 15:49	10 size of the driver determined by the ten transistors 15:52
11 dissipate the power they generate. And once you have 15:49	11 or the two transistors? 15:52
12 that area, even if you only use two, you've got the 15:49	12 A If you ever turn on the ten transistors, 15:52
13 area, because you're committed to the area for the 15:49	13 that's a heavier load than the two. You must design 15:52
14 ten. 15:49	14 the driver to have an area that can dissipate the 15:52
15 Q Okay. So the answer to my question is that 15:49	15 power of ten transistors all being on. 15:52
16 if you have a driver that's composed of ten 15:49	16 Q Okay. So regardless of whether it's the two 15:52
17 transistors, regardless of whether you're driving two 15:49	17 transistors driving a load or the ten transistors 15:52
18 or ten of them, the driver size is ten transistors? 15:50	18 driving a load, to you, it's just a single driver? 15:52
19 A No. The driver size is the physical 15:50	19 MR. RUECKHEIM: Object to the form. 15:52
20 dimension of the driver. 15:50	20 THE WITNESS: I'm sorry. The -- I need to 15:52
21 Q Okay. Sorry. I withdraw the question. 15:50	21 know the hypothesis. We have one -- one transistor in 15:52
22 So let me just ask the original question 15:50	22 a driver; is that correct? 15:53
23 again: If only two of the ten transistors are used to 15:50	23 MR. TEZYAN: No. 15:53
24 drive a load, is the physical size of the driver 15:50	24 Q So the -- it's -- it's the same example as 15:53
25 determined by the ten transistors? 15:50	25 before where you have a ten-transistor driver, right, 15:53
Page 147	
1 driver determined by the ten transistors or the two 15:49	1 Q -- I'll -- I'll -- I'll ask the question 15:51
2 transistors? 15:49	2 again: You have -- you have a driver that is 15:51
3 A I asked a question: Do you ever turn on all 15:49	3 comprised of ten transistors; right? 15:51
4 ten transistors? 15:49	4 A Yes. 15:51
5 Q You could. But in this situation, you're 15:49	5 Q Okay. And you can use the ten transistors to 15:51
6 just using two. 15:49	6 drive a load, or you can use a subset of those 15:51
7 A I think you answered my question. If you can 15:49	7 transistors, in this example two, to drive a load. 15:51
8 turn on all ten, the driver size is related to the 15:49	8 A I understand. 15:52
9 load that you can drive. And if you're going to drive 15:49	9 Q Okay. In this hypothetical, is the physical 15:52
10 ten transistors, you have to have enough area to 15:49	10 size of the driver determined by the ten transistors 15:52
11 dissipate the power they generate. And once you have 15:49	11 or the two transistors? 15:52
12 that area, even if you only use two, you've got the 15:49	12 A If you ever turn on the ten transistors, 15:52
13 area, because you're committed to the area for the 15:49	13 that's a heavier load than the two. You must design 15:52
14 ten. 15:49	14 the driver to have an area that can dissipate the 15:52
15 Q Okay. So the answer to my question is that 15:49	15 power of ten transistors all being on. 15:52
16 if you have a driver that's composed of ten 15:49	16 Q Okay. So regardless of whether it's the two 15:52
17 transistors, regardless of whether you're driving two 15:49	17 transistors driving a load or the ten transistors 15:52
18 or ten of them, the driver size is ten transistors? 15:50	18 driving a load, to you, it's just a single driver? 15:52
19 A No. The driver size is the physical 15:50	19 MR. RUECKHEIM: Object to the form. 15:52
20 dimension of the driver. 15:50	20 THE WITNESS: I'm sorry. The -- I need to 15:52
21 Q Okay. Sorry. I withdraw the question. 15:50	21 know the hypothesis. We have one -- one transistor in 15:52
22 So let me just ask the original question 15:50	22 a driver; is that correct? 15:53
23 again: If only two of the ten transistors are used to 15:50	23 MR. TEZYAN: No. 15:53
24 drive a load, is the physical size of the driver 15:50	24 Q So the -- it's -- it's the same example as 15:53
25 determined by the ten transistors? 15:50	25 before where you have a ten-transistor driver, right, 15:53
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1 where a subset of them can be used to drive the load, 15:53	1 difference? 15:58
2 or all ten can be used to drive the load; right? 15:53	2 A Well, if we're looking at a die that has a 15:58
3 A I got it. 15:53	3 certain physical area for the driver, I can answer 15:58
4 Q Okay. And in -- in that example, you're 15:53	4 your question. But I don't know the context. I don't 15:58
5 saying that it's the same driver of the same physical 15:53	5 understand your question. If the area is saying if 15:58
6 size, whether you use the subset or whether you use 15:53	6 you enable 0 or if you enable both, I can't really 15:58
7 all ten of them; right? 15:53	7 tell what you're talking about. 15:58
8 A That's correct. 15:53	8 Q You're saying the area could vary if you 15:58
9 (Document remotely marked Exhibit 13 15:54	9 enabled one of the drivers versus enabling both of the 15:58
10 for identification.) 15:54	10 drivers? 15:58
11 MR. TEZYAN: Q. Can you please refresh your 15:54	11 A I'm asking you. Are you telling me the area 15:58
12 Exhibit Share. 15:54	12 doesn't vary? Is that correct? 15:58
13 A Okay. 15:54	13 Q I'm -- I'm just asking you, sir, as a person 15:58
14 Q I've marked another exhibit. It's 15:54	14 of ordinary skill in the art -- 15:58
15 Exhibit 13. Please let me know when you have it. 15:54	15 A I haven't read the patent for sure. I don't 15:58
16 A Okay. I see it in my -- in my computer as 15:54	16 know if he's talking about being able to vary the area 15:59
17 the name of the document. I've just loaded it up, and 15:55	17 at some point. 15:59
18 I'm about to download. 15:55	18 The selection could be at design time or it 15:59
19 Okay. I've downloaded it. I'm about to open 15:55	19 could be in the field. If you're going to vary the 15:59
20 it. 15:55	20 area at design time, then you would have drivers that 15:59
21 I have it open. 15:55	21 physically have different area on these -- on these 15:59
22 Q Okay. And this is U.S. Patent No. 7,969,192 15:55	22 chips. But if -- if you fix the area at some point 15:59
23 to Wyman et al.; is that right? 15:55	23 and you vary the enables in the field, that's a 15:59
24 A That's correct. 15:55	24 different story. 15:59
25 Q And I -- I mean, take -- take a minute to 15:55	25 I don't know which one applies. 15:59
Page 150	Page 152
1 look over the document. But I -- I just want to ask 15:55	1 Q Are you saying you vary the size of the 15:59
2 you questions about the driver circuit that's depicted 15:55	2 enables in the field? Is that what you're saying? 15:59
3 in Figure 3, just to understand your testimony on 15:55	3 A If there were a way to vary the size of that 15:59
4 driver size. 15:55	4 device in the field in some fashion -- I don't know 15:59
5 A (Reading document.) 15:55	5 how they would do it. I'm asking you, is that the 15:59
6 I have not studied this patent. This is 15:56	6 case? At design time, I would understand. But 15:59
7 going to be hard to respond. I'll try. Go ahead and 15:56	7 maybe -- I haven't read the patent, so I don't know 15:59
8 ask your question. 15:57	8 about the area. You'll have -- I'm asking you what 16:00
9 Q Okay. My question has to do with Figure 3 of 15:57	9 the -- what the answer is to that question. 16:00
10 Wyman. And in Figure 3, do you see the two triangles 15:57	10 Q Okay. But how would the size of one of those 16:00
11 in the center, 302-1 and 302-2? 15:57	11 drivers be varied in the field? 16:00
12 A I do. 15:57	12 A I think you've answered the question. Your 16:00
13 Q And those depict tristate driver circuits; 15:57	13 hypothesis is that if this is changed in the field, 16:00
14 right? 15:57	14 the area doesn't change. 16:00
15 And if you need to confirm that, you can go 15:57	15 Is that your hypothesis? 16:00
16 to column 3, line 50. 15:57	16 Q No, sir. 16:00
17 A I see -- I see the enable 0 and enable 1 15:57	17 I'm simply asking you: What is the size of 16:00
18 may -- so -- and the symbol is of a tristate driver. 15:57	18 this driver circuit 300? 16:00
19 Yes, I see that. 15:57	19 MR. RUECKHEIM: Object to the form. 16:00
20 Q Okay. So if only 302-1 is enabled, what is 15:57	20 THE WITNESS: The drive -- the size of 16:00
21 the size of the driver circuit? 15:57	21 circuit 300 is the size of the circuit on the die. 16:00
22 MR. RUECKHEIM: Object to the form. 15:57	22 And that size may be different from die to die if you 16:00
23 THE WITNESS: Okay. This is on the die, and 15:57	23 could change the circuit from die to die at design 16:00
24 it's through manufacturing; is that correct? 15:58	24 time. 16:00
25 MR. TEZYAN: Q. Why would that make a 15:58	25 MR. TEZYAN: Okay. 16:01
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<p>1 Q Well, if we assume that driver circuit 300 is 16:01</p> <p>2 fixed in area, and just one or both of these enable 0, 16:01</p> <p>3 enable 1 drivers can be enabled or disabled, what 16:01</p> <p>4 would be your answer? 16:01</p> <p>5 MR. RUECKHEIM: Object to the form. 16:01</p> <p>6 THE WITNESS: I'm not sure what the question 16:01</p> <p>7 is. But I think the question is, what's the size of 16:01</p> <p>8 the driver 300? Is that your question? 16:01</p> <p>9 MR. TEZYAN: Let me put the question in 16:01</p> <p>10 another way. 16:01</p> <p>11 Q If the size of driver 300 is fixed in area, 16:01</p> <p>12 does the driver size depend on whether either of these 16:01</p> <p>13 enable 0 and enable 1 drivers is enabled or disabled? 16:02</p> <p>14 MR. RUECKHEIM: Object to the form. 16:02</p> <p>15 THE WITNESS: The driver size on the die 16:02</p> <p>16 that's fixed is the dimension of the -- of that 16:02</p> <p>17 driver. And the reason that it's a fixed dimension 16:02</p> <p>18 when you can enable one or the other is that the 16:02</p> <p>19 driver size has to be fixed to accommodate the 16:02</p> <p>20 worst-case power dissipation. 16:02</p> <p>21 If you design it for enable 0 only, and then 16:02</p> <p>22 you drive it with both enable 0 and enable 1 driven -- 16:02</p> <p>23 driving it, you can burn up the chip. So you design 16:02</p> <p>24 for the worst case. 16:02</p> <p>25 And therefore, you design for having enable 0 16:02</p> <p style="text-align: right;">Page 154</p>	<p>1 A That's correct. 16:04</p> <p>2 Q Understood. 16:04</p> <p>3 Okay. I think we can take a break. 16:04</p> <p>4 THE VIDEOGRAPHER: We are going to go off the 16:04</p> <p>5 record. The time is 4:04 p.m. 16:04</p> <p>6 And it's the end of Media Unit No. 7. 16:04</p> <p>7 (Recess taken.) 16:04</p> <p>8 THE VIDEOGRAPHER: We are going back on the 16:17</p> <p>9 record. The time is 4:17 p.m. 16:17</p> <p>10 And this is the start of Media Unit No. 8. 16:17</p> <p>11 MR. TEZYAN: Welcome back, Dr. Stone. 16:17</p> <p>12 Q Did you have any communications with your 16:17</p> <p>13 counsel during the break? 16:17</p> <p>14 A I did not. 16:17</p> <p>15 Q Dr. Stone, the earliest of the patents you 16:17</p> <p>16 analyzed has a priority date that goes back to 2007; 16:17</p> <p>17 right? 16:17</p> <p>18 A I believe so. I -- I -- that sounds right. 16:17</p> <p>19 Q Okay. So earlier, I asked you about the 16:17</p> <p>20 distinction between the term "rank" and the term 16:17</p> <p>21 "bank." I believe I asked 2006, but, you know, circa 16:17</p> <p>22 2006-2007. 16:17</p> <p>23 Do you recall that discussion? 16:17</p> <p>24 A I do. 16:17</p> <p>25 MR. TEZYAN: Okay. I think if you refresh 16:17</p> <p style="text-align: right;">Page 156</p>
<p>1 and enable 1 on if that could ever happen. That's the 16:02</p> <p>2 size of the -- the driver 300. 16:02</p> <p>3 MR. TEZYAN: Okay. 16:02</p> <p>4 Q So let's say driver 300 is X at fabrication; 16:02</p> <p>5 right? 16:03</p> <p>6 If both enable 0 and enable 1 are on, the 16:03</p> <p>7 driver size is still X; right? 16:03</p> <p>8 A The driver size is the physical area. And by 16:03</p> <p>9 enabling one or both of those drivers, you don't 16:03</p> <p>10 change that physical area. So the driver size is 16:03</p> <p>11 fixed. 16:03</p> <p>12 Q So the answer to my question would be "yes"? 16:03</p> <p>13 MR. RUECKHEIM: Object to the form. 16:03</p> <p>14 THE WITNESS: Is there a question pending? I 16:03</p> <p>15 don't -- 16:03</p> <p>16 MR. TEZYAN: Q. Well, the question was that 16:03</p> <p>17 if we say driver 300 has an area X, if enable 0 and 16:03</p> <p>18 enable 1 are both on, the driver size is still X; 16:03</p> <p>19 right? 16:03</p> <p>20 A That's correct. 16:03</p> <p>21 Q Okay. And if enable 0 is on but enable 1 is 16:03</p> <p>22 off, the driver size is still X; right? 16:04</p> <p>23 A That's correct. 16:04</p> <p>24 Q Okay. And if vice versa, enable 1 is on but 16:04</p> <p>25 enable 0 is off, driver size is still X? 16:04</p> <p style="text-align: right;">Page 155</p>	<p>1 your Exhibit Share, you'll see I've marked Exhibit 16:17</p> <p>2 No. 14. 16:18</p> <p>3 (Document remotely marked Exhibit 14 16:18</p> <p>4 for identification.) 16:18</p> <p>5 MR. TEZYAN: Q. Let me know when you have 16:18</p> <p>6 it, please. 16:18</p> <p>7 A I see it now. 16:18</p> <p>8 Q Okay. And Exhibit No. 14 is a document -- 16:18</p> <p>9 A Let me do that. 16:18</p> <p>10 Q Oh, go ahead. Sorry. 16:18</p> <p>11 A I have it now on my screen. 16:19</p> <p>12 Q Okay. And this is a document titled: 16:19</p> <p>13 "Frequently Asked Questions." 16:19</p> <p>14 Right? 16:19</p> <p>15 A That's correct. 16:19</p> <p>16 Q And on the bottom -- you can see on the 16:19</p> <p>17 bottom of page 2, there is the Micron logo; correct? 16:19</p> <p>18 A That's correct. 16:19</p> <p>19 Q And it says "crucial.com"; right? 16:19</p> <p>20 A That's correct. 16:19</p> <p>21 Q And Crucial is a Micron brand; right? 16:19</p> <p>22 A Say that question again. 16:19</p> <p>23 Q Crucial is a Micron brand; right? 16:19</p> <p>24 A I'm not aware. 16:19</p> <p>25 Q Okay. So on page 2 where it says: 16:19</p> <p style="text-align: right;">Page 157</p>

<p>1 "What is the difference between a 'bank' and 16:19  2 a 'rank'?" 16:19  3 Do you see that? 16:19  4 A I see that. 16:19  5 Q And it distinguishes between the term "bank" 16:19  6 and the term "rank" by saying: 16:19  7 "Banks are specific to individual DRAM 16:19  8 components and refer to sub-arrays within the DRAM 16:19  9 component. Ranks are specific to memory modules and 16:20  10 refer to a sub-array made of multiple DRAM 16:20  11 components." 16:20  12 Right? 16:20  13 A I see that. 16:20  14 Q Okay. And so my question is: Does this 16:20  15 distinction -- let me withdraw. 16:20  16 And I'll ask: Would a person of ordinary 16:20  17 skill in the art have been aware of this distinction 16:20  18 between bank and rank? 16:20  19 MR. RUECKHEIM: Object to the form, and 16:20  20 beyond the scope. 16:20  21 THE WITNESS: Yeah, I need to know the date. 16:20  22 MR. TEZYAN: Q. You know, I don't know if 16:20  23 this document has a date. 16:20  24 A It does. It's 2023 copyright. Okay. 16:20  25 So in 2023, a person of ordinary skill in the 16:20  Page 158</p>	<p>1 A I'm uploading it. Just one moment. 16:23  2 I have now opened Exhibit 15 in my PDF 16:23  3 reader. 16:23  4 Q Okay. Exhibit 15 is titled: 16:23  5 "Synchronous DRAM Architectures, 16:23  6 Organizations, and Alternative Technologies." 16:23  7 Right? 16:23  8 A That's correct. 16:23  9 Q Okay. And the date of this paper is 16:23  10 December 10th, 2002; right? 16:23  11 A That's correct. 16:23  12 Q Okay. Let's jump to page 2, please. 16:24  13 A I haven't read this document. May I have a 16:24  14 moment? 16:24  15 Q Yeah, certainly. 16:24  16 A (Reading document.) 16:24  17 Okay. What I'd like to say is I have scanned 16:27  18 this article. I'm generally familiar with the 16:28  19 technology, but the details are very dense and 16:28  20 extensive. 16:28  21 I'll do my best to answer the questions, but 16:28  22 I reserve the right to say, I'm sorry. I just haven't 16:28  23 studied this carefully. 16:28  24 Q Fair enough. 16:28  25 So on page 2, it says that: 16:28  Page 160</p>
<p>1 art would know the difference between bank and rank. 16:20  2 Q Okay. But is it your testimony that in 2007, 16:20  3 a person of ordinary skill in the art would not have 16:21  4 known this distinction? 16:21  5 A I haven't justified that. I don't know the 16:21  6 answer. 16:21  7 Q Okay. Well, here, it says that ranks are 16:21  8 specific to DRAM components; is that fair? 16:21  9 MR. RUECKHEIM: Object to the form. 16:21  10 THE WITNESS: That's not fair. 16:21  11 MR. TEZYAN: Okay. 16:21  12 Q Why not? 16:21  13 A In my book, I talk about how to build SRAM 16:21  14 memories and also DRAM memories, and I have banks for 16:21  15 both. And so at the time that I wrote the book in 16:21  16 1982, a bank would apply just as equally to a static 16:21  17 RAM as it would to a dynamic RAM. 16:21  18 (Document remotely marked Exhibit 15 16:22  19 for identification.) 16:22  20 MR. TEZYAN: Q. Dr. Stone, could you please 16:22  21 refresh your Exhibit Share. 16:22  22 A Sure. 16:22  23 Q I've marked Exhibit 15. 16:22  24 A We have Exhibit 15; is that correct? 16:23  25 Q Yes, sir. 16:23  Page 159</p>	<p>1 "The term 'DRAM' stands for dynamic random 16:28  2 access memory." 16:28  3 Do you see that? 16:28  4 A I see that. 16:28  5 Q And it says: 16:28  6 "It is characterized as 'dynamic' primarily 16:28  7 because the values held in the memory array's storage 16:28  8 cells are represented by small electric charges that 16:28  9 slowly leak out of the circuit over time." 16:28  10 Right? 16:28  11 A I see that. 16:28  12 Q Okay. So DRAM -- I'm sorry. Let me rephrase 16:28  13 the question. 16:28  14 A person of ordinary skill in the art would 16:28  15 understand that DRAM has memory cells; right? 16:28  16 MR. RUECKHEIM: Object to the form, and 16:28  17 beyond the scope. 16:28  18 THE WITNESS: I'm sorry. Repeat your 16:29  19 question, please. 16:29  20 MR. TEZYAN: Certainly. 16:29  21 Q So a person of ordinary skill in the art 16:29  22 would understand that DRAM has memory cells; right? 16:29  23 MR. RUECKHEIM: Same objection. 16:29  24 THE WITNESS: I'm sorry. I can't follow your 16:29  25 words. "DRAM has," and then it got garbled. 16:29  Page 161</p>

1 MR. TEZYAN: I'm sorry. I'll try to speak 16:29	1 rank is used in the rest of this document, if you 16:32
2 clearer. 16:29	2 don't mind. The document may talk about it in 16:32
3 Q So a person of ordinary skill in the art 16:29	3 different contexts. 16:32
4 would understand that DRAM has memory cells; right? 16:29	4 MR. TEZYAN: Q. Yes, go ahead. 16:32
5 MR. RUECKHEIM: Same objection. 16:29	5 And let me direct you, for example, to 16:32
6 THE WITNESS: Are you saying DRAM has memory 16:29	6 page 4, and that's Footnote 3. So Footnote 3, for 16:32
7 cells? You're swallowing that word. 16:29	7 example, says: 16:33
8 MR. TEZYAN: Yes. 16:29	8 "The number of banks within a rank is usually 16:33
9 THE WITNESS: It has memory cells. 16:29	9 equal to the number of banks within a single DRAM 16:33
10 MR. TEZYAN: Q. And specifically, the 16:29	10 device." 16:33
11 smallest unit within a DRAM is a memory cell; right? 16:29	11 Do you see that? 16:33
12 A I don't agree with that particularly. Where 16:29	12 A I'm looking at Footnote 3 on page 4; is that 16:33
13 do you see -- is that in this article? 16:30	13 correct? 16:33
14 Q Yes. So if you'd scroll up to the figure 16:30	14 Q Yes, sir. 16:33
15 that's immediately above this paragraph. 16:30	15 A Ask your question again. 16:33
16 A Okay. Well, that -- that picture, it -- it 16:30	16 Q So this is distinguishing bank from rank; 16:33
17 destroys your argument. That -- the smallest item in 16:30	17 correct? 16:33
18 the -- in this particular thing is not the storage 16:30	18 A No. 16:33
19 cell. It's either the transistor or the capacitor. 16:30	19 Q In -- no? Why is that wrong? 16:33
20 Q Fair enough. 16:30	20 A The word "usually" is in the front -- the 16:33
21 But the -- the smallest unit of -- of memory 16:30	21 first line of Footnote 3. I would say usually, it 16:33
22 is that storage cell that's comprised of the capacitor 16:30	22 distinguishes bank from rank. But "usually" means not 16:33
23 and transistor; fair? 16:30	23 always. 16:33
24 MR. RUECKHEIM: Object to the form of the 16:30	24 Q Okay. Fair enough. 16:33
25 question; beyond the scope. 16:30	25 Let's go to the above-the-line text where 16:34
Page 162	Page 164
1 THE WITNESS: In smallest -- I don't know how 16:30	1 Footnote 3's call number is. And this is the sentence 16:34
2 you're measuring smallest. Is that physical? Is it, 16:30	2 that starts with: 16:34
3 as you say, strength? I -- I -- I don't know. 16:30	3 "The first step in handling a read request is 16:34
4 MR. TEZYAN: Okay. 16:30	4 for the memory controller to decompose the provided 16:34
5 Q Take a look at the second column on this 16:31	5 data address into components that identify the 16:34
6 page, and particularly in the middle of that first 16:31	6 appropriate rank within the memory system, the bank 16:34
7 full paragraph. And -- and feel free to take a moment 16:31	7 within that rank3, and the row and column inside the 16:34
8 to read that paragraph to yourself, please, and let me 16:31	8 identified bank." 16:34
9 know when you're done. 16:31	9 So this is distinguishing a rank of memory 16:34
10 A (Reading document.) 16:31	10 devices from a bank within one of those memory 16:34
11 I see that, yes. 16:31	11 devices; fair? 16:34
12 Q Okay. So my question is, there's the 16:31	12 MR. RUECKHEIM: Object to the form, and 16:34
13 sentence somewhere in the middle that says: 16:32	13 beyond the scope. 16:34
14 "Lastly, there is a chip-select network that 16:32	14 THE WITNESS: In this case, it does, but it 16:34
15 connects from the memory controller to every DRAM in a 16:32	15 doesn't mean that they're always the same. It says 16:34
16 rank (a separately addressable set of DRAMs)." 16:32	16 "typically" in the sec- -- in the third-to-last line, 16:34
17 Do you see that? 16:32	17 and it says "typically one or more address bits," but 16:34
18 A I do. 16:32	18 not necessarily. 16:34
19 Q And so my question is: Would a person of 16:32	19 MR. TEZYAN: Q. That sentence reads: 16:34
20 ordinary skill in the art in 2002 have known that a 16:32	20 "The bank identifier is typically one or more 16:34
21 rank specifically refers to a separately addressable 16:32	21 address bits." 16:34
22 set of DRAMs as opposed to other non-DRAM memory? 16:32	22 Right? 16:34
23 MR. RUECKHEIM: Object to the form, and 16:32	23 A That's what it says, but it doesn't say how 16:34
24 beyond the scope. 16:32	24 many there are. It could be none. 16:35
25 THE WITNESS: If you -- I have to see how 16:32	25 Q Okay. Well, the previous sentence isn't 16:35
Page 163	Page 165



1 referring to bank identifiers; right? 16:35	1 2002 onwards where rank is used to refer to a set of 16:39
2 MR. RUECKHEIM: Object to the form. 16:35	2 non-DRAM devices? 16:39
3 THE WITNESS: All I'm saying is that if you 16:35	3 A That was not a task that I was assigned, so I 16:39
4 have 0 address bits for bank identifier, then rank and 16:35	4 did not look into that. I do not at this -- as I sit 16:39
5 bank will be the same. Unusual. Possible, yes. 16:35	5 here today, I do not know the answer to that question. 16:39
6 MR. TEZYAN: Okay. 16:35	6 Q Do any of the documents referenced in your 16:39
7 Q But fair to say that generally by 2002, a 16:35	7 declaration use the term "rank" to refer to a set of 16:39
8 person of ordinary skill in the art would have 16:35	8 non-DRAM memory devices? 16:39
9 understood bank and rank to be different terms; fair? 16:35	9 A I will look at my -- I -- I didn't look for 16:39
10 MR. RUECKHEIM: Object to the form; beyond 16:35	10 rank and -- and bank in the documents I cited in 16:39
11 the scope. 16:35	11 the -- in my declaration. So I don't know if the 16:39
12 THE WITNESS: I believe that this is 16:35	12 answer is "yes" or "no." 16:39
13 consistent with "generally," yes. 16:35	13 Q The question wasn't about bank. It was about 16:39
14 MR. TEZYAN: Okay. 16:35	14 non-DRAM memory devices. So I'll just go ahead and 16:39
15 Q So returning to page 2 and that sentence: 16:35	15 ask it again. 16:39
16 "Lastly, there is a chip-select network that 16:35	16 A Okay. Go ahead. 16:39
17 connects from the memory controller to every DRAM in a 16:36	17 Q Do any of the documents referenced in your 16:39
18 rank (a separately addressable set of DRAMs)." 16:36	18 declaration use the term "rank" to refer to a set of 16:40
19 A I got lost. Where are you reading from? 16:36	19 non-DRAM memory devices? 16:40
20 Q This is the middle of page 2, the sentence 16:36	20 MR. RUECKHEIM: Object to the form. 16:40
21 that starts "Lastly" in the first full paragraph on 16:36	21 THE WITNESS: I actually didn't check on 16:40
22 the right column. 16:36	22 that. I don't know. I don't know the answer. 16:40
23 A Right column. Got it. 16:36	23 MR. TEZYAN: Q. Dr. Stone, how long have you 16:40
24 Q And he says: 16:36	24 been working in the memory industry? 16:40
25 "Lastly, there is a chip-select network that 16:36	25 A My first memory design with integrated 16:40
Page 166	Page 168
1 connects from the memory controller to every DRAM in a 16:36	1 circuits was 1973 or 1974. And I continued with 16:40
2 rank (a separately addressable set of DRAMs)." 16:36	2 memory design through my retirement at IBM in 2001. 16:40
3 Do you see that? 16:36	3 Subsequently, I've been engaged as an expert witness 16:40
4 A I do. I haven't confirmed that he's using 16:36	4 analyzing documents that involve memory design. 16:40
5 bank and rank separately through the whole document. 16:36	5 So I would say almost continually since 1973 16:40
6 I don't know that's the case. 16:36	6 or '74 I've been involved with memory design, either 16:40
7 Q Yeah, go ahead. 16:36	7 doing it myself or analysis of memory designs. 16:40
8 A Okay. Go ahead and ask your question. 16:38	8 Q Okay. I think I'm about done, but there's 16:41
9 Q So my question is: Is it fair to say that by 16:38	9 just one set of questions I want to go back to to 16:41
10 2002, a person of ordinary skill in the art would 16:38	10 clarify, if I may. 16:41
11 understand the term "rank" to refer to a set of DRAMs? 16:38	11 Can we please go back to Exhibit 7. 16:41
12 MR. RUECKHEIM: Object to the form. 16:38	12 A Okay. 16:42
13 THE WITNESS: The issue I have is that this 16:38	13 Q I just have one clarifying question. 16:42
14 is the -- what they call extrinsic evidence. And 16:38	14 A I have it in front of me. 16:42
15 based on this, a person of skill in the art may 16:38	15 Q And could we go to paragraph 63, please. 16:42
16 believe one thing. But with extrinsic evidence, there 16:38	16 A Let me confirm that I -- this is my -- 16:42
17 may be other documents that say the opposite. 16:38	17 Exhibit 7 is my declaration, I believe? Yes. 16:42
18 This is not directly what is taught in the 16:38	18 Q Yes, sir. It's your declaration in 16:42
19 patent unless you can identify where it is in the 16:38	19 IPR2018-00363. 16:42
20 patent. 16:38	20 A Okay. And what -- and we're going to 16:42
21 So I -- I will say, based on this, the answer 16:38	21 paragraph -- what paragraph? 16:42
22 could be "yes," but it also could be "no" if I had 16:38	22 Q 63. 16:42
23 access to the extrinsic evidence at the time. 16:38	23 A 53. 16:42
24 MR. TEZYAN: Okay. 16:39	24 Q 63. So that's on PDF page 30. 16:42
25 Q Are you aware of any extrinsic evidence from 16:39	25 A I have 63 on page 30, yes. 16:42
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<p>1 Q And earlier, we were discussing a series of 16:43  2 hypotheticals where the memory controller may or may 16:43  3 not experience certain load of the memory devices. 16:43  4 Do you recall that conversation? 16:43  5 A I do. 16:43  6 Q Okay. So I just want to clarify with this 16:43  7 one specific example, just so I make sure I understand 16:43  8 your testimony. 16:43  9 In this situation where there is the X, 16:43  10 right, data path B is -- is disabled; right? 16:43  11 And if you want to confirm that, you can 16:43  12 read -- 16:43  13 A I didn't see the figure you're talking about. 16:43  14 Q Oh, I'm sorry. So it's -- 16:43  15 A Figure 5; right? 16:43  16 Q Correct. It's Figure 5. 16:43  17 And you can read paragraph 64 if that will -- 16:43  18 A Okay. 16:43  19 Q -- help. 16:43  20 A And it's on page 31 that you're referring to? 16:43  21 Q Yes, sir. 16:43  22 A And I see the X. Now ask your question. 16:43  23 Q So my question is: The X indicates that data 16:43  24 path B is disabled; right? 16:43  25 A That's correct. 16:44</p> <p style="text-align: right;">Page 170</p>	<p>1 But that go -- it actually goes through 518. 16:45  2 Are you asking what 518 sees or what, in this case, 16:45  3 420 sees? 16:45  4 MR. TEZYAN: Q. I'm asking what 420 sees. 16:45  5 A It sees the load from 518. I don't see how 16:45  6 what's happening with the X changes the load that 518 16:45  7 presents to the controller. 16:45  8 Q 518, if you look at paragraph 64, is just the 16:46  9 data line. 16:46  10 So maybe let me ask the question this way: 16:46  11 Is it the load of 503 that the memory controller will 16:46  12 experience? 16:46  13 MR. RUECKHEIM: Object to the form. 16:46  14 THE WITNESS: I have to -- I'm sorry. I have 16:46  15 to make sure that 518 is what you say it is. 16:46  16 MR. TEZYAN: Yeah. 16:46  17 Q And that's paragraph 64. 16:46  18 A So your assumption is that D is -- has no 16:47  19 active component in it; is that correct? 16:47  20 Q That's right. 16:47  21 A If it has no active component, now I 16:47  22 understand more of your question. 16:47  23 And what is your question again? 16:47  24 Q My question is: In -- in this configuration 16:47  25 where data is being driven along data path A from the 16:47</p> <p style="text-align: right;">Page 172</p>
<p>1 Q Okay. So if data path B is disabled, how 16:44  2 many loads will the memory controller see in this 16:44  3 configuration? 16:44  4 MR. RUECKHEIM: Object to the form. 16:44  5 THE WITNESS: Memory controller 518? 16:44  6 MR. TEZYAN: Q. Memory controller is 420 on 16:44  7 the bottom left. 16:44  8 A System Memory Controller; is that correct? 16:44  9 Q What's that? 16:44  10 A 420 you said to be System Memory Controller; 16:44  11 is that correct? 16:44  12 Q Yes, sir. 16:44  13 And my question is: How many loads will the 16:44  14 memory controller experience in this configuration? 16:44  15 Will it experience the loads of both Memory 16:44  16 Ranks A and C, or will it experience only one load? 16:44  17 MR. RUECKHEIM: Object to the form. 16:44  18 THE WITNESS: The memory controller will 16:45  19 experience at least the load of Y1. But the load on 16:45  20 Y2 may be adjusted on line -- on -- on chip -- on chip 16:45  21 changing the -- the resistor. That would be on die 16:45  22 control of the load. 16:45  23 And so because Y2 is disabled, if they change 16:45  24 the load on the driver 506, then the System Memory 16:45  25 Controller may see something different. 16:45</p> <p style="text-align: right;">Page 171</p>	<p>1 memory controller, is the load that the memory 16:47  2 controller sees the load of 503? 16:47  3 MR. RUECKHEIM: Object to the form. 16:47  4 THE WITNESS: Well, the -- in both cases, it 16:47  5 sees the load of 503. But that load may not be the 16:47  6 same in both cases. 16:47  7 MR. TEZYAN: I'm sorry. 16:47  8 Q What's the second case? 16:47  9 A Well, you have a case where A is driving, and 16:47  10 a case in another figure where the 506 is driving, B, 16:48  11 and the -- or a case where neither of them are 16:48  12 driving. 16:48  13 But the -- the load that 503 sees is not the 16:48  14 sum of the loads on 504 and 506 if there is online die 16:48  15 termination, because the online die termination can 16:48  16 change the load of an inactive driver. 16:48  17 Q Okay. Would the load that the memory 16:48  18 controller sees increase in the absence of 503? 16:48  19 MR. RUECKHEIM: Object to the form; beyond 16:48  20 the scope. 16:48  21 THE WITNESS: In the absence of 503? 16:48  22 MR. TEZYAN: Yes, sir. 16:48  23 THE WITNESS: The memory controller is 16:48  24 driving memory; right? 16:48  25 MR. TEZYAN: Yes, sir. 16:48</p> <p style="text-align: right;">Page 173</p>

<p>1 THE WITNESS: And you're asking me, you don't 16:48  2 have 503 now that's driving memory? I don't know how 16:48  3 that's possible. 16:49  4 MR. TEZYAN: Q. But 503 is a write buffer; 16:49  5 correct, sir? 16:49  6 You can confirm that in paragraph 64. 16:49  7 A Okay. And you're asking me to leave out the 16:49  8 write buffer; is that correct? 16:49  9 Q Well, let me ask you first: What does the 16:49  10 write buffer do in this implementation? 16:49  11 MR. RUECKHEIM: Object to the form. 16:49  12 THE WITNESS: It could do one of two things. 16:49  13 As a buffer, it -- it will receive in the -- 16:49  14 regenerate. Another thing it can do is delay a clock 16:49  15 time if it's clocked. It doesn't have to be clocked, 16:49  16 but if it is clocked, it can delay. 16:49  17 MR. TEZYAN: Okay. 16:49  18 Q And the question is just: If we were to take 16:49  19 this configuration in Figure 5 and remove write 16:49  20 buffer 503, would the load that the memory controller 16:49  21 sees increase or decrease? 16:50  22 MR. RUECKHEIM: Object to the form. 16:50  23 THE WITNESS: I can't tell from the figure. 16:50  24 Okay. Let me hypothesize that the load would 16:50  25 be the same, because somehow by magic, online die 16:50  Page 174</p>	<p>1 THE WITNESS: I'm missing some context here. 16:52  2 Just before Section D, the quote reads: 16:54  3 "That is substantially the same as the load 16:54  4 that the memory controller 420 would present." 16:54  5 I'm trying to find 420 in these figures. 16:54  6 Oh, there it is. Now I got it. Okay. I got 16:54  7 it. 16:54  8 Q Okay. 16:56  9 A I understand. Now you can ask your question, 16:56  10 and I can answer it. 16:56  11 Q Okay. My question was: In the absence of 16:56  12 that write buffer 503, would the load that the memory 16:56  13 controller sees increase or decrease? 16:56  14 MR. RUECKHEIM: Object to the form. 16:56  15 THE WITNESS: Well, I'm not sure I can answer 16:56  16 that question exactly. 16:56  17 But I am informed by this quote that the load 16:56  18 presented by 503 is deliberately set to be what the 16:56  19 system controller would see if there weren't the Y1, 16:56  20 Y2, and things like that. 16:56  21 503 is designed to present a load similar to 16:56  22 a memory cell. I'll show you where that is. Look at 16:56  23 paragraph 66 at the beginning, and it says: 16:56  24 "Data transmission circuits 416" -- "present 16:57  25 a load [to the memory]" -- "controller" -- on the 16:57  Page 176</p>
<p>1 determination on Y2 is injected. So there is no load 16:50  2 caused by 506. And the load of 504 is identical to 16:50  3 the load of 503. In that case, there is no change. 16:50  4 That's hypothesis. I'm not saying that's 16:50  5 what's going to happen. 16:50  6 Otherwise, I don't know what's going to 16:50  7 happen. I have to see the numbers. 16:50  8 MR. TEZYAN: Q. Let's jump to paragraph 66, 16:50  9 and maybe this can help clarify for me what's going 16:51  10 on. So you write that: 16:51  11 "The '907 Patents' data transmission 16:51  12 circuits 416 [(red box)] present a load [to the 16:51  13 memory controller 420] on the data lines 518 from the 16:51  14 write buffer 503 and the read buffer 509 ... that is 16:51  15 substantially the same as the load that one of the 16:51  16 memory devices 412 would present." 16:51  17 Is that right? 16:51  18 A Just a moment. 16:51  19 That's a quote from the patent. So if you're 16:51  20 asking me if that's what I put in there as a quote 16:51  21 from the patent, that's what I put in there, yes. 16:51  22 Q Okay. Well, I'm asking: In the absence of 16:51  23 that write buffer 503, would the load that the memory 16:51  24 controller sees increase or decrease? 16:52  25 MR. RUECKHEIM: Object to the form. 16:52  Page 175</p>	<p>1 lines -- on -- "data lines 518 from the write 16:57  2 buffer 503 and the read buffer 509 ... that is 16:57  3 substantially the same as the load that one of the 16:57  4 memory devices" -- 16:57  5 That's by design. Okay. The designer says, 16:57  6 I know what the load is on memory, and I'm going to 16:57  7 make that load on 503. And in going the reverse 16:57  8 direction, the same holds true. I don't have to 16:57  9 analyze that right now. 16:57  10 So you're asking a hypothetical which just -- 16:57  11 I don't understand how that hy- -- hypothetical 16:57  12 would -- would come into play. 16:57  13 Here, we have the situation -- I'm looking at 16:57  14 the figure just above paragraph 64 -- where deliberate 16:57  15 design makes the load 503 equal to the memory. 16:57  16 And you're saying, Take it out. What 16:57  17 happens? 16:57  18 I don't know. I know that the designer 16:57  19 wouldn't want to do that. Anything the designer would 16:57  20 put in would try to make that load the same as the 16:58  21 memory. But I don't know what's there. 16:58  22 MR. TEZYAN: Okay. Fair enough. 16:58  23 Q My question was just whether you know or not 16:58  24 if taking out that write buffer 503 would increase or 16:58  25 decrease the load. 16:58  Page 177</p>

1 For example, would you see the load of both 16:58	1 follow the rules that I had in my book. 17:01
2 of those memory devices A and C? 16:58	2 Q Can I ask where on your CV that is? 17:01
3 A I know that there are -- 16:58	3 A Pardon me? 17:01
4 MR. RUECKHEIM: Objection. 16:58	4 Q Can I ask where on your CV that's listed, 17:01
5 THE WITNESS: -- several possibilities. 16:58	5 sir? 17:01
6 Okay. If your -- I didn't mean to interrupt your 16:58	6 A You should be looking at the -- I'll show you 17:01
7 question. Finish your question. 16:58	7 where. Chapter 4. I'll bring it up in a minute. I 17:01
8 MR. TEZYAN: Q. No, sir. That was the 16:58	8 just have one more sentence to say. 17:01
9 question. Go ahead. 16:58	9 They redesigned the board. It passed sea 17:01
10 A Okay. I know that there are several 16:58	10 trials. 17:01
11 possibilities, and they don't matter. 16:58	11 Okay. Let's show you where it is. 17:01
12 One possibility is the -- the on-chip 16:58	12 Q Well, I can just cut to the chase and ask my 17:01
13 termination. It makes the load of Y2 or Y1 the same 16:58	13 question: What year was that, sir? 17:01
14 as the memory. And then when you disable Y1 or Y2, 16:58	14 A What year? The year I did this was 1984, 17:01
15 you don't change a load. That's a possibility. Okay. 16:58	15 1985, something on that -- or '83, '84, '85. 17:01
16 Another possibility is that there is still 16:59	16 Q Okay. So have you ever designed DDR memory 17:01
17 some load in Y1 and Y2, but the combined load is the 16:59	17 modules? 17:01
18 same as the memory load. So whether the Y1 or Y2 is 16:59	18 A I have. 17:01
19 in tristate load, you fix the load so that the total 16:59	19 Q When? 17:01
20 load is the same as memory. 16:59	20 A When did I do that? 17:01
21 These are various possibilities. 16:59	21 I was engaged in the design of a memory for 17:01
22 MR. TEZYAN: Okay. Just a few final 16:59	22 the IBM Power PC, and I was on the design team for 17:02
23 questions. 16:59	23 that memory. So I personally didn't lay out the 17:02
24 Q Dr. Stone, have you designed memory modules? 16:59	24 memory design, but I did this while I was working at 17:02
25 A I have. 16:59	25 IBM 1982, '83. And that was DDR memory, an early 17:02
Page 178	Page 180
1 Q What kind of memory modules? 16:59	1 version of it. 17:02
2 A Well, one that -- that's in my book. But 16:59	2 I'm sorry. I got the wrong year. 1992 to 17:02
3 more -- let me tell you a story about how I did a 16:59	3 1993. 17:02
4 design review and corrected a real problem. 16:59	4 Q Okay. But fair to say you've never designed, 17:02
5 If you look at my vitae, you'll see that I 16:59	5 you know, DDR4 memory modules? 17:02
6 was a consultant to Sperry. Sperry made, at that 16:59	6 A I have never designed DDR4 memory modules. 17:02
7 time, navigation computers for the nuclear fleet -- 16:59	7 That is correct. 17:02
8 the strategic nuclear fleet. 16:59	8 Q Okay. And the same with DDR5 memory modules, 17:02
9 They called me because they put a new 16:59	9 I take it? 17:02
10 navigation computer in a -- in a nuclear sub, sent it 17:00	10 A I have never designed DDR5 memory modules. 17:02
11 out for sea trials, and it failed sea trials. So they 17:00	11 Q And just a quick follow-up question on the 17:02
12 asked me to come. 17:00	12 load reduction issues we were discussing a moment ago. 17:02
13 I came, they showed me the board, and I knew 17:00	13 You said with on-die termination, the load on path A 17:03
14 what the problem was. I knew. Okay. So I didn't 17:00	14 or path B would change; correct? 17:03
15 know how Sperry designed their memory boards for their 17:00	15 A That's what my testimony was, yeah. On-die 17:03
16 personal computers. I had no idea. 17:00	16 termination changes how waves react when they touch a 17:03
17 I told the people there to bring me in a 17:00	17 device. 17:03
18 board designed for the personal computers, and they 17:00	18 Q Okay. So would the memory controller see 17:03
19 did. And so I -- for the first time in my life, I saw 17:00	19 more than one load if the write buffer 503 is not 17:03
20 that board, and I compared it to the navigation 17:00	20 there? 17:03
21 computer board. I held them up. 17:00	21 MR. RUECKHEIM: Object to the form. 17:03
22 I said, Look, they're different. And the 17:00	22 THE WITNESS: I -- I have a lot of problems 17:03
23 reason that the failure occurred in the fleet is 17:00	23 with that. The load can be expressed as the 17:03
24 because the fleet navigation computer failed to follow 17:00	24 impedance -- the input impedance of Y2, or it can be 17:03
25 the rules for designing memory. In fact, it failed to 17:00	25 expressed in another way. So I'm not sure what you 17:03
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1 mean by "load." 17:03	1 load by reducing the length in line, because you don't 17:06
2 MR. TEZYAN: Q. Let's -- let's start with 17:03	2 have to visit 503. 17:06
3 capacitive load. 17:03	3 So if you insist on writing -- routing a line 17:06
4 A Capacitive load? 17:03	4 to a place where 503 might have been, then rerouting 17:06
5 Q Uh-huh. So I'll just reframe my question 17:03	5 it to Y2 so that the line length is the same, yeah, 17:06
6 then. 17:04	6 the capacitive load will be the same. But it doesn't 17:06
7 A Okay. 17:04	7 have to be that way. 17:06
8 Q So would the memory controller see more than 17:04	8 MR. TEZYAN: Okay. 17:06
9 one capacitive load if the write buffer 503 is not 17:04	9 Q So would the load that the memory controller 17:06
10 there? 17:04	10 sees increase if the write buffer 503 is not there or 17:06
11 MR. RUECKHEIM: Object to the form. 17:04	11 decrease -- 17:06
12 THE WITNESS: If 503 is not there, there will 17:04	12 MR. RUECKHEIM: Object to the form. 17:06
13 be capacitive load on the conductor that goes from 518 17:04	13 MR. TEZYAN: Q. -- all else being equal? 17:06
14 to one of the Y2s and Y1s. It would see capacitive 17:04	14 A I think I've answered that question. The 17:06
15 load. And that could be about the same as if 503 is 17:04	15 answer is, you can't tell, because I don't know the 17:06
16 there, or it could be more if 503 is there -- I'm 17:04	16 length of the line that you're actually going to put 17:06
17 sorry. 17:04	17 in. 17:06
18 I don't -- putting 503 in the loop may or may 17:04	18 I know that your hypothesis says that the 17:06
19 not increase the capacitive load, be- -- because the 17:04	19 line length is the same. I'm saying, Oh, okay. The 17:06
20 lines may have to be rerouted to go to 503 before they 17:04	20 capacitance will be the same. 17:07
21 go to Y2, and they can be shorter if they go directly 17:04	21 I don't think that's what's going to happen. 17:07
22 to Y2. Okay. 17:04	22 So your -- your hypothetical may not be true. And 17:07
23 So I don't know how the capacitors change 17:04	23 what is true is the line length may be longer, equal, 17:07
24 when you take 503 in or out. You talk -- I can't 17:05	24 or shorter, and that's what the situation is. 17:07
25 tell. 17:05	25 MR. TEZYAN: Okay. Pass the witness. 17:07
Page 182	Page 184
1 MR. TEZYAN: Okay. 17:05	1 MR. RUECKHEIM: Let's take a ten-minute 17:07
2 Q But assuming the lines are the same length, 17:05	2 break. 17:07
3 would the capacitive load change? 17:05	3 THE WITNESS: Okay. 17:07
4 MR. RUECKHEIM: Object to the form. 17:05	4 THE VIDEOGRAPHER: We're going to go off the 17:07
5 THE WITNESS: To the extent that the 17:05	5 record. The time is 5:07 p.m. 17:07
6 capacitive load is determined by that particular line, 17:05	6 And it's the end of Media Unit No. 8. 17:07
7 if the line is the same length, it won't change. 17:05	7 (Recess taken.) 17:08
8 MR. TEZYAN: Right. 17:05	8 THE VIDEOGRAPHER: We are going back on the 17:19
9 Q But what I'm saying is, you're saying, and 17:05	9 record. The time is 5:19 p.m. 17:19
10 correct me if I'm wrong, that it depends in part on 17:05	10 And this is the start of Media Unit No. 9. 17:19
11 whether if you take that write buffer out, and you 17:05	11 17:19
12 also swap the -- the length of that line. 17:05	12 EXAMINATION 17:19
13 Is that what you're saying? 17:05	13 BY MR. RUECKHEIM: 17:19
14 A I'm saying that the capacitive load depends 17:05	14 Q Hello, Dr. Stone. 17:19
15 on the length of the connection between D and Y2. And 17:05	15 A Hello. 17:19
16 if you put 503 in and out, that length can increase or 17:05	16 Q If you can turn to Exhibit 1, which was your 17:19
17 can decrease. And so I can't tell you if the 17:05	17 declaration. 17:19
18 capacitive load is bigger, smaller, or equal. 17:05	18 A I have it. 17:20
19 Q Okay. And what I'm saying is, if you just 17:05	19 Q Okay. The declaration you submitted in this 17:20
20 take 503 out, and you don't change the length of that 17:05	20 case involved which U.S. patents? 17:20
21 connection between D and Y1, does the capacitive load 17:06	21 A I think I have a list of them. It involved 17:20
22 change? 17:06	22 the '060 and the '160, and also involved the '9 -- 17:20
23 MR. RUECKHEIM: Objection. 17:06	23 there it is -- '918 and the '054. 17:20
24 THE WITNESS: If you don't -- okay. If you 17:06	24 Q And if you can turn to -- starting around at 17:20
25 take 503 out, you'll probably change the capacitive 17:06	25 the bottom of page 7 of your declaration. 17:20
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<p>1 A Okay. Give me a minute. 17:20</p> <p>2 I'm at page 7 at the bottom. 17:21</p> <p>3 Q Okay. And did you provide opinions as to 17:21</p> <p>4 what would constitute the level of ordinary skill in 17:21</p> <p>5 the art for the patents you just mentioned? 17:21</p> <p>6 A I did. 17:21</p> <p>7 Q And did you apply those -- those levels of 17:21</p> <p>8 ordinary skill in coming up with your opinions? 17:21</p> <p>9 A I did. 17:21</p> <p>10 Q Did you provide opinions as to what would 17:21</p> <p>11 constitute a person of ordinary skill in the art with 17:21</p> <p>12 respect to any other patents? 17:21</p> <p>13 A Well, this is just the '060 and '160. I did 17:21</p> <p>14 one for the '918 and the '054. That's on page 8. 17:21</p> <p>15 Q And did you provide opinions as to what would 17:21</p> <p>16 constitute a person of ordinary skill's knowledge with 17:21</p> <p>17 respect to any other patents in your declaration? 17:21</p> <p>18 A I did not. 17:21</p> <p>19 MR. RUECKHEIM: Thank you. 17:21</p> <p>20 No further questions. 17:21</p> <p>21 MR. TEZYAN: I have some follow-up questions. 17:21</p> <p>22 17:21</p> <p>23 FURTHER EXAMINATION 17:21</p> <p>24 BY MR. TEZYAN: 17:21</p> <p>25 Q Dr. Stone, while we're on paragraph 23, you 17:21</p> <p style="text-align: right;">Page 186</p>	<p>1 Q You testified earlier that in preparation for 17:23</p> <p>2 this deposition, you reviewed the parties' briefs in 17:23</p> <p>3 this case; is that right? 17:24</p> <p>4 A I reviewed the parties' briefs. Yeah, I did 17:24</p> <p>5 that. 17:24</p> <p>6 Q And those briefs include arguments for the 17:24</p> <p>7 '506 patent; is that right? 17:24</p> <p>8 A I'd have to look. I believe that's the case, 17:24</p> <p>9 but I -- may I confirm? 17:24</p> <p>10 Q Yes, sir. 17:24</p> <p>11 A And the patent number was, what, '506? 17:24</p> <p>12 Q Yes, sir. 17:24</p> <p>13 A I have confirmed that the '506 is discussed 17:24</p> <p>14 in the brief from Netlist. 17:24</p> <p>15 Q And those briefs also include argument for 17:24</p> <p>16 the '339 patent; right? 17:25</p> <p>17 MR. RUECKHEIM: Object to the form. 17:25</p> <p>18 THE WITNESS: Okay. Let's see. 17:25</p> <p>19 MR. TEZYAN: Q. That's the one that 17:25</p> <p>20 discusses fork in the road. 17:25</p> <p>21 A Yes. I -- I'm just checking to verify that 17:25</p> <p>22 it's in this. 17:25</p> <p>23 It did. It's -- it is discussed in the 17:25</p> <p>24 Netlist brief. 17:25</p> <p>25 Q And is it fair to say that the subject matter 17:25</p> <p style="text-align: right;">Page 188</p>
<p>1 say that a hypothetical person would have been 17:22</p> <p>2 familiar with the JEDEC industry standards, 17:22</p> <p>3 knowledgeable about design and operation of SDRAM -- 17:22</p> <p>4 sorry -- DRAM and SDRAM memory devices and memory 17:22</p> <p>5 modules, and going on, such a hypothetical person 17:22</p> <p>6 would have been familiar with the structure and 17:22</p> <p>7 operation of circuitry used in stacked memory devices; 17:22</p> <p>8 right? 17:22</p> <p>9 A That's correct. 17:22</p> <p>10 Q And would have been familiar with components 17:22</p> <p>11 including ASICs, FPGAs, CPLDs, and low-level circuits 17:22</p> <p>12 such as tristate buffers; right? 17:22</p> <p>13 A Are you asking, did I see that? Or what's 17:22</p> <p>14 your question? 17:22</p> <p>15 Q I'm asking if you see that. 17:22</p> <p>16 A I see that, and I did that. 17:22</p> <p>17 Q Okay. And in paragraph 25, you provide a 17:22</p> <p>18 substantially similar explanation for what you believe 17:22</p> <p>19 a person of ordinary skill in the art at the time of 17:22</p> <p>20 these inventions would have known; is that fair? 17:22</p> <p>21 A That's fair. That's correct. 17:22</p> <p>22 Q And you also testified that in preparing for 17:23</p> <p>23 this deposition, you reviewed the parties' briefs in 17:23</p> <p>24 this case; right? 17:23</p> <p>25 A Repeat your question, please. 17:23</p> <p style="text-align: right;">Page 187</p>	<p>1 of the '506 and '339 patent are similar to the subject 17:25</p> <p>2 matter of the '918, '054, '160, and '060 patents? 17:25</p> <p>3 MR. RUECKHEIM: Object to the form. 17:25</p> <p>4 THE WITNESS: The patents are different. And 17:25</p> <p>5 similarity, I don't know what's in your mind. I know 17:25</p> <p>6 the claims are different, and there is some technology 17:25</p> <p>7 that's similar. 17:25</p> <p>8 I can't answer your question as asked without 17:25</p> <p>9 understanding it better. 17:25</p> <p>10 MR. TEZYAN: Okay. Fair enough. 17:25</p> <p>11 Q But a person of ordinary skill in the art in 17:26</p> <p>12 the '339 and '506 patents would have had some common 17:26</p> <p>13 knowledge as a person of ordinary skill in the art 17:26</p> <p>14 with the '918 and '054 patents, let's say? 17:26</p> <p>15 MR. RUECKHEIM: Objection to form. 17:26</p> <p>16 THE WITNESS: I'm just checking to see if 17:26</p> <p>17 they're incorporated by reference. I -- I haven't 17:26</p> <p>18 looked everywhere, but I don't see where they're 17:26</p> <p>19 incorporated by reference into the patents I looked 17:26</p> <p>20 at. But let me check a little further. 17:26</p> <p>21 MR. TEZYAN: I don't believe that's 17:27</p> <p>22 necessary. Let me just rephrase my question. 17:27</p> <p>23 Q As an example, is it fair to say that the 17:27</p> <p>24 '060 and '160 patents are directed to load reduction 17:27</p> <p>25 for a memory product? 17:27</p> <p style="text-align: right;">Page 189</p>




<p>1 MR. RUECKHEIM: Object to the form. 17:27</p> <p>2 THE WITNESS: It is fair to say that they 17:27</p> <p>3 are -- address loads and load reduction, yes. 17:27</p> <p>4 MR. TEZYAN: Okay. 17:27</p> <p>5 Q And is it fair to say that the '339 patent is 17:27</p> <p>6 generally directed to load reduction? 17:27</p> <p>7 MR. RUECKHEIM: Object to the form. 17:27</p> <p>8 THE WITNESS: Possibly. I mean, I -- I'd 17:27</p> <p>9 need to bring up the '339 again. 17:27</p> <p>10 MR. TEZYAN: Okay. 17:27</p> <p>11 Q Give me one second, and I'll bring it up for 17:27</p> <p>12 you. 17:27</p> <p>13 A Okay. 17:27</p> <p>14 Q And to be clear, have you reviewed the 17:27</p> <p>15 '339 patent? 17:27</p> <p>16 A Not for this deposition. I'm -- I've 17:27</p> <p>17 reviewed things like it before, and I think you have 17:27</p> <p>18 an IPR where there is a patentee of the '339 or a 17:27</p> <p>19 family member. So I'm familiar with it there, yes. 17:28</p> <p>20 MR. TEZYAN: Okay. Just give me a minute. 17:28</p> <p>21 Okay. If you'll go in the marked exhibits 17:28</p> <p>22 folder, you'll see I've uploaded a new exhibit. 17:28</p> <p>23 (Document remotely marked Exhibit 16 17:28</p> <p>24 for identification.) 17:28</p> <p>25 THE WITNESS: Okay. I'm refreshing now. I 17:28</p> <p style="text-align: right;">Page 190</p>	<p>1 Right? 17:32</p> <p>2 A Yes. 17:32</p> <p>3 Q So the '339 patent is directed to, in part, 17:32</p> <p>4 at least DDR memory modules with ranks comprising DRAM 17:32</p> <p>5 devices; is that fair? 17:32</p> <p>6 MR. RUECKHEIM: Object to the form. 17:32</p> <p>7 THE WITNESS: It is -- it describes "DDR DRAM 17:32</p> <p>8 devices arranged in multiple ranks." Yes, that is 17:32</p> <p>9 true. 17:32</p> <p>10 MR. TEZYAN: Okay. 17:32</p> <p>11 Q And if we go to column 6, line 61, you see 17:33</p> <p>12 the sentence that says: 17:33</p> <p>13 "In addition, as with the memory subsystems 17:33</p> <p>14 100, 100' of FIGS. 1A and 1B, the 'fly-by' memory 17:33</p> <p>15 subsystems 200, 200' of FIGS. 2A and 2B suffer from 17:33</p> <p>16 large loads which result in slower clock speeds." 17:33</p> <p>17 Do you see that sentence? 17:33</p> <p>18 A I do. 17:33</p> <p>19 Q So at least one of the problems that the 17:33</p> <p>20 '339 patent identifies is large loads; is that fair? 17:33</p> <p>21 A I don't believe so. 17:33</p> <p>22 MR. RUECKHEIM: Object to the form. 17:33</p> <p>23 MR. TEZYAN: Q. I'm sorry. I didn't get 17:33</p> <p>24 your answer, sir. 17:33</p> <p>25 A I -- I don't think that's the case. 17:33</p> <p style="text-align: right;">Page 192</p>
<p>1 see the '339 patent is in the folder, and I'm 17:28</p> <p>2 downloading it. 17:29</p> <p>3 I have now uploaded it. It's in my reader. 17:29</p> <p>4 MR. TEZYAN: Okay. 17:29</p> <p>5 Q And just to confirm, what will be marked as 17:29</p> <p>6 Exhibit 16 is U.S. Patent No. 10,949,339; is that 17:29</p> <p>7 correct? 17:29</p> <p>8 A That is correct. 17:29</p> <p>9 Q Okay. So please take a minute to review it, 17:29</p> <p>10 and let me know when you're done. 17:29</p> <p>11 A Okay. Ask your question, please. 17:31</p> <p>12 Q So my question was: Is it fair to say that 17:31</p> <p>13 the '339 patent is generally directed to load 17:31</p> <p>14 reduction? 17:31</p> <p>15 MR. RUECKHEIM: Object to the form. 17:31</p> <p>16 THE WITNESS: I searched for the word 17:31</p> <p>17 "load" and "reduction." I didn't see that. It could 17:31</p> <p>18 be directed to other things besides load reduction, as 17:31</p> <p>19 my understanding goes. 17:32</p> <p>20 MR. TEZYAN: Q. Well, let's go ahead and 17:32</p> <p>21 look at the Abstract, for instance; right? 17:32</p> <p>22 A Okay. 17:32</p> <p>23 Q So the Abstract says that: 17:32</p> <p>24 "The memory module comprises DDR DRAM devices 17:32</p> <p>25 arranged in multiple ranks." 17:32</p> <p style="text-align: right;">Page 191</p>	<p>1 Q Why is that? 17:34</p> <p>2 A It is directed to adjusting timing, and 17:34</p> <p>3 timing may be due to loads or other things. So at 17:34</p> <p>4 least what I read from the paragraph that you just 17:34</p> <p>5 quoted, that it is directed to timing. 17:34</p> <p>6 Q Okay. Fair enough. 17:34</p> <p>7 Let me direct your attention to column 7, 17:34</p> <p>8 line 44. 17:34</p> <p>9 A Okay. Okay. Line 44. I see it. 17:34</p> <p>10 Q And Figure 3 -- it says that: 17:34</p> <p>11 "FIG. 3A schematically illustrates an example 17:34</p> <p>12 memory subsystem 400 with loadreduced memory modules 17:34</p> <p>13 402 in accordance with certain embodiments described 17:34</p> <p>14 herein." 17:34</p> <p>15 Do you see that? 17:34</p> <p>16 A I do. 17:34</p> <p>17 Q Okay. So it's fair to say that at least some 17:34</p> <p>18 embodiments of the invention of the '339 patent are 17:34</p> <p>19 directed to load reduction -- 17:35</p> <p>20 MR. RUECKHEIM: Object to the form. 17:35</p> <p>21 MR. TEZYAN: Q. -- right? 17:35</p> <p>22 A To say that it's directed to load reduction, 17:35</p> <p>23 I think, is putting the cart before the horse. It is 17:35</p> <p>24 directed to memory timing, and one way to deal with 17:35</p> <p>25 memory timing is to reduce load. 17:35</p> <p style="text-align: right;">Page 193</p>



<p>1 I don't know that I would say that they're 17:35</p> <p>2 going to reduce load and not adjust the timing. I 17:35</p> <p>3 believe that the important thing is getting the timing 17:35</p> <p>4 adjusted. 17:35</p> <p>5 Q Okay. But Figure 3A is literally a 17:35</p> <p>6 loadreduced memory module; fair? 17:35</p> <p>7 A That's correct. That is correct. 17:35</p> <p>8 Q Okay. So one solution to the problem that 17:35</p> <p>9 this patent identifies is the loadreduced memory 17:35</p> <p>10 module that's identified in Figure 3A; right? 17:35</p> <p>11 MR. RUECKHEIM: Object to the form. 17:35</p> <p>12 THE WITNESS: That's not the whole solution. 17:35</p> <p>13 That contributes to the solution, but there are other 17:35</p> <p>14 things that contribute to that solution. 17:36</p> <p>15 MR. TEZYAN: Okay. 17:36</p> <p>16 Q How does the '339 patent achieve that load 17:36</p> <p>17 reduction solution? 17:36</p> <p>18 MR. RUECKHEIM: Object to the form. 17:36</p> <p>19 MR. TEZYAN: Q. And if you want to go back 17:36</p> <p>20 to Figure 5 or reference any of the disclosures, go 17:36</p> <p>21 ahead. 17:36</p> <p>22 A It's okay. I'm looking. Okay. 17:36</p> <p>23 The best answer I can give in this is on 17:38</p> <p>24 page -- on column 6 at the very bottom. It describes 17:38</p> <p>25 how one deals with fly-by configurations, and that 17:38</p> <p style="text-align: right;">Page 194</p>	<p>1 or write data from 420 to the memory cells. 17:40</p> <p>2 The memory of 420 in the absence of the 17:40</p> <p>3 circuitry we see in Figure 5 would see the load of a 17:40</p> <p>4 memory cell, let's say the load of 452 or something. 17:40</p> <p>5 And what has happened is the designer has 17:40</p> <p>6 made 503 have a load that is essentially the same as 17:40</p> <p>7 what the 420 memory controller would see if there 17:40</p> <p>8 weren't this intermediate circuitry. 17:40</p> <p>9 So, I mean, that's -- that's really the 17:40</p> <p>10 basis. I think I've answered your question. 17:40</p> <p>11 MR. TEZYAN: Okay. 17:40</p> <p>12 Q And in a read operation, how would the 17:40</p> <p>13 circuitry reduce the load that would otherwise be 17:40</p> <p>14 experienced? 17:41</p> <p>15 A Okay. This is going the other direction. 17:41</p> <p>16 MR. RUECKHEIM: Objection. 17:41</p> <p>17 Go ahead. 17:41</p> <p>18 THE WITNESS: Sorry. Finish. Would you 17:41</p> <p>19 repeat. I -- I -- I stepped over you. Go ahead. You 17:41</p> <p>20 want to repeat your answer -- 17:41</p> <p>21 MR. TEZYAN: I will repeat the question, and 17:41</p> <p>22 then Mr. Rueckheim can repeat his objection if he 17:41</p> <p>23 wants to. 17:41</p> <p>24 Q So the question is: In a read operation, how 17:41</p> <p>25 would the circuitry reduce the load that would 17:41</p> <p style="text-align: right;">Page 196</p>
<p>1 fly-by configurations have been useful to correct 17:38</p> <p>2 timing problems. 17:38</p> <p>3 And -- and it says that there has been a 17:38</p> <p>4 recent suggestion to provide a memory buffer which 17:38</p> <p>5 handles both the control signals and the data signals. 17:38</p> <p>6 And so it describes a way to use a data buffer to 17:38</p> <p>7 correct issues with fly-by that you try to use 17:39</p> <p>8 unsuccessfully. 17:39</p> <p>9 It does say that fly-by is corrupted by load, 17:39</p> <p>10 but it does also say that it's going to use fly-by in 17:39</p> <p>11 conjunction with a memory buffer to handle both 17:39</p> <p>12 control and data signals. 17:39</p> <p>13 So these are various techniques it's using. 17:39</p> <p>14 Q Sorry. I was muted. 17:39</p> <p>15 My question was: Figure 5 of the '339 patent 17:39</p> <p>16 is an example of one of those memory buffers in 17:39</p> <p>17 accordance with the invention; right? 17:39</p> <p>18 MR. RUECKHEIM: Object to the form. 17:39</p> <p>19 THE WITNESS: That's -- that's correct. 17:39</p> <p>20 MR. TEZYAN: Okay. 17:39</p> <p>21 Q So how does Figure 5 go about reducing the 17:39</p> <p>22 load that the memory controller sees? 17:39</p> <p>23 MR. RUECKHEIM: Same objection. 17:39</p> <p>24 THE WITNESS: In Figure 5, let's go to -- in 17:39</p> <p>25 Figure 5, let's talk about doing -- sending commands 17:40</p> <p style="text-align: right;">Page 195</p>	<p>1 otherwise be experienced? 17:41</p> <p>2 MR. RUECKHEIM: Same objection. 17:41</p> <p>3 THE WITNESS: Okay. You have the quote that 17:41</p> <p>4 I inserted into my declaration. The quote said, going 17:41</p> <p>5 in the direction from memory to 420, the circuitry is 17:41</p> <p>6 designed so that the memory cells see a load as if 17:41</p> <p>7 they were driving 420. 17:41</p> <p>8 Let me pull up my -- where I said that in my 17:41</p> <p>9 report. 17:41</p> <p>10 MR. TEZYAN: Q. I believe that was 17:42</p> <p>11 paragraph 66 of Exhibit 7. 17:42</p> <p>12 A Yes, I -- I got it. I'm reading 65: 17:42</p> <p>13 "For a read operation, the data transmission 17:42</p> <p>14 circuit 416 [(red box)] operates as a multiplexing 17:42</p> <p>15 circuit. In the illustrated embodiment of Fig. 5, for 17:42</p> <p>16 example, data signals read from the memory devices 412 17:42</p> <p>17 of a rank are received at the first or second 17:42</p> <p>18 terminals" -- 17:42</p> <p>19 Et cetera. 17:42</p> <p>20 And then it says later on at -- at 17:42</p> <p>21 paragraph 66 at the bottom, it says: 17:43</p> <p>22 "Similarly, the data transmission circuits 17:43</p> <p>23 416 [(red box)] present a load [to the memory devices 17:43</p> <p>24 412] on the first and second terminals Y1, Y2" -- 17:43</p> <p>25 Okay. So there is a deliberate design to 17:43</p> <p style="text-align: right;">Page 197</p>

<p>1 make the memory circuits see a load that's the same as 17:43</p> <p>2 they would see if they were the -- driving the memory 17:43</p> <p>3 controller 420. 17:43</p> <p>4 And this quote ends with the phrase: 17:43</p> <p>5 "That is substantially the same as the load 17:43</p> <p>6 that the memory controller 420 would present." 17:43</p> <p>7 So the way they're doing with load is to 17:43</p> <p>8 imitate the load you would see if you didn't have 17:43</p> <p>9 these devices present. 17:43</p> <p>10 Q Okay. And just to make sure I understand, in 17:44</p> <p>11 a read operation, what is the role that read 17:44</p> <p>12 buffer 509 plays in reducing the load? 17:44</p> <p>13 MR. RUECKHEIM: Object to the form; well 17:44</p> <p>14 beyond the scope of the redirect. 17:44</p> <p>15 THE WITNESS: Are you asking me -- now, I'm 17:44</p> <p>16 looking at the annotated figure on page 31 of my 17:44</p> <p>17 report. I'm sorry. Yes. Page -- 17:44</p> <p>18 MR. TEZYAN: Yeah. 17:44</p> <p>19 Q You can look at that one, or you can look at 17:44</p> <p>20 the '339 patent. 17:44</p> <p>21 A Okay. And you're asking what role the 17:44</p> <p>22 driver 509 plays. The 509 driver is the driver that's 17:44</p> <p>23 driving the system memory. That's its role. 17:44</p> <p>24 Q How does it contribute to load reduction for 17:45</p> <p>25 a read operation? 17:45</p> <p style="text-align: right;">Page 198</p>	<p>1 MR. RUECKHEIM: Same objections. 17:46</p> <p>2 THE WITNESS: It's the circuitry that is put 17:46</p> <p>3 in between the memory ranks in 518D. It's the 17:46</p> <p>4 circuitry that does the fork in the road, if you wish, 17:46</p> <p>5 something like that. 17:46</p> <p>6 MR. TEZYAN: Okay. Understood. 17:46</p> <p>7 Q So you're saying essentially in the absence 17:46</p> <p>8 of a data buffer, the load experienced by the memory 17:46</p> <p>9 would be the load presented by the system memory 17:46</p> <p>10 controller and the load presented by the other modules 17:47</p> <p>11 that share the bus. 17:47</p> <p>12 Do I have that right? 17:47</p> <p>13 A That's correct. 17:47</p> <p>14 MR. RUECKHEIM: Same objections. 17:47</p> <p>15 MR. TEZYAN: Okay. 17:47</p> <p>16 Q And then I guess my more specific question 17:47</p> <p>17 was, say you keep that circuitry intact, right, but 17:47</p> <p>18 you take out read buffer 509. 17:47</p> <p>19 For a read operation, does that affect the 17:47</p> <p>20 load that the memory devices experience? 17:47</p> <p>21 MR. RUECKHEIM: Same objections. 17:47</p> <p>22 THE WITNESS: My belief is that it does, but 17:47</p> <p>23 I can't tell with certainty because we don't have 17:47</p> <p>24 enough detail. 17:47</p> <p>25 The reason I believe it does is that 509 is 17:47</p> <p style="text-align: right;">Page 200</p>
<p>1 I think that's -- that's my question. 17:45</p> <p>2 MR. RUECKHEIM: Same objections. 17:45</p> <p>3 THE WITNESS: It's isolated. I -- I -- the 17:45</p> <p>4 memory -- the key thing here is the load that the 17:45</p> <p>5 memory sees. And the memory sees the load from Y1 or 17:45</p> <p>6 Y2 which may be less than it would see if it had to 17:45</p> <p>7 drive system memory and all the other -- all the other 17:45</p> <p>8 modules that share the bus. The memory only sees Y1. 17:45</p> <p>9 And the contribution of 509 to that, it 17:45</p> <p>10 doesn't really change the load. The contribution is 17:45</p> <p>11 from the fork in the road. 509 drives the system that 17:45</p> <p>12 way. That's its role. 17:45</p> <p>13 MR. TEZYAN: Okay. 17:45</p> <p>14 Q So in the absence of 509, the load 17:45</p> <p>15 experienced by the memory devices in a read operation 17:45</p> <p>16 would stay the same. 17:45</p> <p>17 Is that what you're saying? 17:45</p> <p>18 MR. RUECKHEIM: Object to the form; beyond 17:46</p> <p>19 the scope. 17:46</p> <p>20 THE WITNESS: The load experienced by memory 17:46</p> <p>21 in the absence of all that circuitry would be the load 17:46</p> <p>22 presented by the system memory controller and the load 17:46</p> <p>23 presented by other modules that share the bus. 17:46</p> <p>24 MR. TEZYAN: Q. What do you mean by "all 17:46</p> <p>25 that circuitry," sir? 17:46</p> <p style="text-align: right;">Page 199</p>	<p>1 isolated from Y2 by these -- by 508. So I can't tell 17:47</p> <p>2 if you take out Y2 and 508 -- I'm sorry. 17:47</p> <p>3 What are you taking out? 17:48</p> <p>4 MR. TEZYAN: Let me clarify. 17:48</p> <p>5 Q So you're just taking out 509. 17:48</p> <p>6 And my question is: If you just take out 17:48</p> <p>7 509, does the load that's experienced by a memory 17:48</p> <p>8 device in this system change as a result? 17:48</p> <p>9 MR. RUECKHEIM: Same objections. 17:48</p> <p>10 THE WITNESS: Okay. You're going to take out 17:48</p> <p>11 509, but still have Y2 and Y1? 17:48</p> <p>12 MR. TEZYAN: Uh-huh. 17:48</p> <p>13 THE WITNESS: Is that correct? 17:48</p> <p>14 MR. TEZYAN: Yes, sir. 17:48</p> <p>15 THE WITNESS: The load experienced by the 17:48</p> <p>16 memory is the load presented by Y1 and Y2. 509 has no 17:48</p> <p>17 impact on that. 17:48</p> <p>18 MR. TEZYAN: Q. And in a write operation, if 17:48</p> <p>19 you were to take out 503, leaving everything else the 17:48</p> <p>20 same, would the load on the memory controller change? 17:48</p> <p>21 MR. RUECKHEIM: Same objections. 17:48</p> <p>22 THE WITNESS: We discussed this earlier 17:48</p> <p>23 because of the complexity. And you're telling me that 17:49</p> <p>24 you're going to leave everything else the same, but 17:49</p> <p>25 you're taking out 503. And I just -- it's hard for me 17:49</p> <p style="text-align: right;">Page 201</p>

<p>1 to fathom that, because you don't have to route your 17:49</p> <p>2 wires to 503. Okay. 17:49</p> <p>3 But if you're going to insist that all the 17:49</p> <p>4 capacitance stays the same, if you take out 503, 17:49</p> <p>5 probably the capacitance would increase without 503, 17:49</p> <p>6 probably, but not necessarily. And so the load would 17:49</p> <p>7 increase. 17:49</p> <p>8 But if you can actually shorten the line 17:49</p> <p>9 between 518 and Y2 and Y1 because 503 is not present, 17:49</p> <p>10 it doesn't necessarily follow that capacitance of the 17:49</p> <p>11 load would increase. 17:49</p> <p>12 MR. TEZYAN: Okay. 17:49</p> <p>13 Q But you say that the load would -- that 17:49</p> <p>14 capacitance would probably increase. 17:50</p> <p>15 Why -- why do you think it would probably 17:50</p> <p>16 increase? 17:50</p> <p>17 MR. RUECKHEIM: Same objections. 17:50</p> <p>18 THE WITNESS: I -- if you are trying to 17:50</p> <p>19 connect D and Y2, and you have to go through an 17:50</p> <p>20 intermediate spot, you lose the ability to go directly 17:50</p> <p>21 from D to Y2. Okay. If you can't go directly, you 17:50</p> <p>22 probably have a longer path. That's why I say that. 17:50</p> <p>23 Did I answer your question? 17:50</p> <p>24 MR. TEZYAN: I don't think so. So let me see 17:50</p> <p>25 if I can go back to your testimony. 17:50</p> <p style="text-align: right;">Page 202</p>	<p>1 higher? 17:52</p> <p>2 MR. RUECKHEIM: Same objections. 17:52</p> <p>3 THE WITNESS: Okay. If you don't change the 17:52</p> <p>4 length of the path -- I'm sorry. 17:52</p> <p>5 If you leave the path alone, the way it is, 17:52</p> <p>6 you take out 503, the path between D through the 503 17:52</p> <p>7 removal and then on to Y2 would probably be longer 17:52</p> <p>8 than the path from D to 503. Possibly. 17:52</p> <p>9 So it might be the case that removing 503 and 17:52</p> <p>10 leaving all the other path lengths alone, you increase 17:53</p> <p>11 the capacitance. Therefore, you increase the load. 17:53</p> <p>12 MR. TEZYAN: Okay. I have no further 17:53</p> <p>13 questions, pending questions from Micron counsel. 17:53</p> <p>14 MR. RUECKHEIM: No questions from Micron. 17:53</p> <p>15 MR. TEZYAN: Okay. 17:53</p> <p>16 MR. RUECKHEIM: We're done. 17:53</p> <p>17 MR. TEZYAN: We can go off the record. 17:53</p> <p>18 STENOGRAPHIC REPORTER: Do you both need a 17:53</p> <p>19 copy? 17:53</p> <p>20 MR. RUECKHEIM: Yes. 17:53</p> <p>21 MR. TEZYAN: Yeah. 17:53</p> <p>22 First, Dr. Stone, thank you very much. I 17:53</p> <p>23 appreciate your time. 17:53</p> <p>24 THE WITNESS: You're welcome. You're 17:53</p> <p>25 welcome. 17:53</p> <p style="text-align: right;">Page 204</p>
<p>1 Q So you said if you take out 503, probably the 17:50</p> <p>2 capacitance would increase without 503; right? 17:50</p> <p>3 A That's correct. 17:50</p> <p>4 Q Okay. And I'm asking why you think that's 17:50</p> <p>5 the case. 17:51</p> <p>6 MR. RUECKHEIM: Same objections. 17:51</p> <p>7 THE WITNESS: Okay. Look at it 17:51</p> <p>8 geometrically. D is a point. Y is a point. There is 17:51</p> <p>9 a straight line that could connect D to Y. It has a 17:51</p> <p>10 certain length. 17:51</p> <p>11 Now, 503 is another point. If I drew a 17:51</p> <p>12 straight line from D to 503, and it did not lie in the 17:51</p> <p>13 path between D and Y1 directly, and then I connected 17:51</p> <p>14 503 to Y1, the length of the path from D to 503 to Y1 17:51</p> <p>15 would be longer than the direct path from D to Y1. 17:51</p> <p>16 And you're telling me that you would take out 17:51</p> <p>17 503 and not change the path. 17:51</p> <p>18 I'm saying that A, if you're going to take 17:51</p> <p>19 out 503, I'm going to make the path direct, as direct 17:51</p> <p>20 as I can. I will shorten the path. And that's why I 17:51</p> <p>21 believe it's realistic to assume that the capacitance 17:51</p> <p>22 would be lower. 17:51</p> <p>23 MR. TEZYAN: Okay. 17:51</p> <p>24 Q But assuming you don't change the size of the 17:52</p> <p>25 path, then the capacitance would be the same or 17:52</p> <p style="text-align: right;">Page 203</p>	<p>1 MR. TEZYAN: All right. You can hop off now. 17:53</p> <p>2 THE VIDEOGRAPHER: Is there anything further? 17:53</p> <p>3 MR. TEZYAN: What's that? 17:53</p> <p>4 THE VIDEOGRAPHER: Counsel, do you want to go 17:53</p> <p>5 off the record? 17:53</p> <p>6 MR. TEZYAN: Yeah, yeah, yeah. 17:53</p> <p>7 THE VIDEOGRAPHER: Okay. If there is nothing 17:53</p> <p>8 further, we are off the record at 5:53 p.m. Pacific 17:53</p> <p>9 Daylight Time. And this concludes today's testimony 17:53</p> <p>10 given by Dr. Harold Stone. 17:53</p> <p>11 The total number of media used was nine and 17:53</p> <p>12 will be retained by Veritext legal solutions. 17:53</p> <p>13 STENOGRAPHIC REPORTER: You would like it in 17:54</p> <p>14 two days? 17:54</p> <p>15 MR. TEZYAN: Yes, please. 17:54</p> <p>16 STENOGRAPHIC REPORTER: Mr. Rueckheim, did 17:54</p> <p>17 you need it in two days? 17:54</p> <p>18 MR. RUECKHEIM: We'll do the same. 17:54</p> <p>19 (WHEREUPON, the deposition ended 17:54</p> <p>20 at 5:54 p.m.) 17:54</p> <p>21 ---oOo---</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p> <p style="text-align: right;">Page 205</p>

<p>1 CERTIFICATE OF STENOGRAPHIC REPORTER</p> <p>2</p> <p>3 I, ANDREA M. IGNACIO, hereby certify that the</p> <p>4 witness in the foregoing remote deposition was by me</p> <p>5 sworn to tell the truth, the whole truth, and nothing</p> <p>6 but the truth in the within-entitled cause;</p> <p>7 That said remote deposition was taken in</p> <p>8 shorthand by me, a disinterested person, at the time</p> <p>9 and place therein stated, and that the testimony of</p> <p>10 the said witness was thereafter reduced to</p> <p>11 typewriting, by computer, under my direction and</p> <p>12 supervision;</p> <p>13 That before completion of the deposition,</p> <p>14 review of the transcript [ ] was [x] was not</p> <p>15 requested. If requested, any changes made by the</p> <p>16 deponent (and provided to the reporter) during the</p> <p>17 period allowed are appended hereto.</p> <p>18 I further certify that I am not of counsel or</p> <p>19 attorney for either or any of the parties to the said</p> <p>20 deposition, nor in any way interested in the event of</p> <p>21 this cause, and that I am not related to any of the</p> <p>22 parties thereto.</p> <p>23 Dated: June 27, 2023</p> <p>24 </p> <p>25 ANDREA M. IGNACIO, RPR, CRR, CCRR, CLR, CSR No. 9830</p> <p style="text-align: right;">Page 206</p>	<p>1 __ Federal R&amp;S Requested (FRCP 30(e)(1)(B)) – Locked .PDF</p> <p>2 Transcript - The witness should review the transcript and</p> <p>3 make any necessary corrections on the errata pages included</p> <p>4 below, notating the page and line number of the corrections.</p> <p>5 The witness should then sign and date the errata and penalty</p> <p>6 of perjury pages and return the completed pages to all</p> <p>7 appearing counsel within the period of time determined at</p> <p>8 the deposition or provided by the Federal Rules.</p> <p>9 xx Federal R&amp;S Not Requested - Reading &amp; Signature was not</p> <p>10 requested before the completion of the deposition.</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p> <p style="text-align: right;">Page 208</p>
<p>1 MICHAEL TEZYAN, Esq.</p> <p>2 mtezyan@irell.com</p> <p>3 June 27, 2023</p> <p>4 RE: NETLIST, INC. vs. MICRON TECHNOLOGY, INC.</p> <p>5 JUNE 26, 2023, HAROLD STONE, Ph.D., JOB NO. 5968770</p> <p>6</p> <p>7 The above-referenced transcript has been</p> <p>8 completed by Veritext Legal Solutions and</p> <p>9 review of the transcript is being handled as follows:</p> <p>10 __ Per CA State Code (CCP 2025.520 (a)-(e)) – Contact Veritext</p> <p>11 to schedule a time to review the original transcript at</p> <p>12 a Veritext office.</p> <p>13 __ Per CA State Code (CCP 2025.520 (a)-(e)) – Locked .PDF</p> <p>14 Transcript - The witness should review the transcript and</p> <p>15 make any necessary corrections on the errata pages included</p> <p>16 below, notating the page and line number of the corrections.</p> <p>17 The witness should then sign and date the errata and penalty</p> <p>18 of perjury pages and return the completed pages to all</p> <p>19 appearing counsel within the period of time determined at</p> <p>20 the deposition or provided by the Code of Civil Procedure.</p> <p>21 __ Waiving the CA Code of Civil Procedure per Stipulation of</p> <p>22 Counsel - Original transcript to be released for signature</p> <p>23 as determined at the deposition.</p> <p>24 __ Signature Waived – Reading &amp; Signature was waived at the</p> <p>25 time of the deposition.</p> <p style="text-align: right;">Page 207</p>	